The
GEOGRAPHICAL JOURNAL

Vol CI No 3 R.G.S. *March 1943*

JAPANESE OPERATIONS IN NEW GUINEA

MISS L. E. CHEESMAN

Meeting of the Society, 11 January 1943

JAPAN struck very swiftly in the Pacific, with great force and in many different directions at once; when she had occupied the Netherlands Indies she stretched out farther to the south and attacked New Guinea: according to plan. As is well known, preparations for this Pacific war had been in progress for over twenty years. Japanese fishermen, pearl-fishers and shell-fishers, have thoroughly surveyed the coasts of Pacific islands, taking soundings and photographing even small bays and inlets; their numberless small craft were constantly found in pretended ignorance busying themselves in waters where they had no rights. Spies and agents settled all over the Netherlands Indies in the guise of traders, business men, travellers, tourists, and scientists. Japanese propaganda newspapers published in Malay and Dutch were actually printed in Java. All intelligent people living in that part of the world held no illusions about the menace of Japan, her power to strike, and the impossibility of defending those islands against invasion.

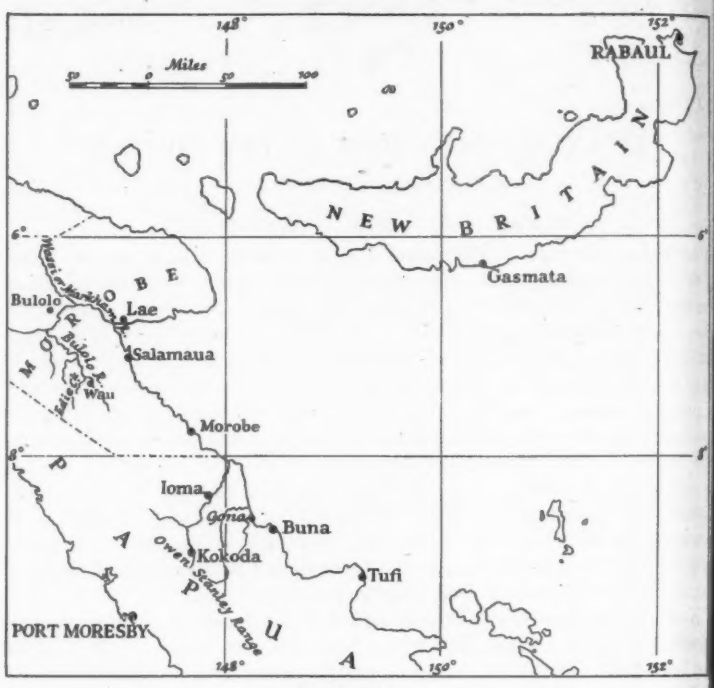
New Guinea has always been included in the Japanese plans to occupy *Nanyo* (the South Lands). Before war broke out very useful stepping stones had been made from Japan in that direction. Strong colonies of Japanese had settled in the south of Mindanao (Philippines), in Portuguese Timor, and in the Aru and Kei islands. In Netherlands New Guinea 137,000 acres were leased from the Dutch to Japanese planters for what purported to be experimental cotton growing.

On Timor a clever diplomatic move had been successfully negotiated with the Portuguese, resulting in a monopoly in coffee which is the main product of the Portuguese territory, and is traded with Makassar. An air line was run between Timor and Celebes by the Japanese, and they approached the Dutch with a proposal to have their own shipping line as well. This being refused, the Japanese held up the coffee indefinitely rather than use Dutch transport, thus attempting to disorganize the Union of Coffee Producers which had its headquarters in Java.

One of the Japanese Cotton Research Stations which I visited on the coast

of Geelvinck Bay, in the north of Netherlands New Guinea, was being maintained at a loss. The site was unsuitable, the cotton trees were so badly attacked by insect pests that they were cut down before the first crop ripened, only the second crop, which was of inferior quality, was gathered. There were five hundred souls on this small plantation.

The Dutch were fully cognizant of these underground activities. Wherever there was discontent or unrest among the many different peoples of those islands Japanese agents were always at hand, ready to foment any



The battle area

trouble and support attempts to undermine Dutch authority. When subversive plots became too apparent the Dutch took strong action. In 1941 out of eight thousand Japanese residents six thousand were repatriated. Among the incriminating documents seized on this occasion one is of particular interest because it refers to New Guinea and its proposed function in the new Japanese Pacific Empire of the future.

In a pamphlet published by His Majesty's Stationery Office some of these documents are quoted. Unfortunately the translation from Japanese into English is so bad that the greater part is unintelligible. I therefore applied to Captain Rayment, R.N., who is one of the few people in England with a thorough knowledge of the Japanese language, and he kindly re-translated

Sketch of Kokoda aerodrome

Wewak harbour, Mandated Territory, now a Japanese naval base

Upper forest, moss laden trees, Owen Stanley Mountains

Upper forests now belong to Owen Stanley Mountains

the following passages into what is probably equivalent to that which the writer had in mind. Document V (in which these passages occur) is a letter written by the manager of a trading company in Tokyo to the manager of a branch of the same company in Netherlands New Guinea. "It ought not to be necessary to import products of Nanyo which Japan needs, but practical effect should be given to the Japanese policy of having such things produced by the Japanese themselves. Japan's development has been, and continues to be, so rapid that the Mandated Islands alone cannot meet all requirements. We must therefore overflow into great New Guinea. Very quietly the moment approaches when we shall make our great flight." The products referred to in connection with New Guinea are probably oil and gold.

It was on 23 January 1942, after preliminary air attacks, that the first Japanese forces landed at Rabaul in New Britain, and at Salamaua and Finschhafen in the Mandated Territory. After the Australians had beaten off eleven attacks Rabaul with its fine harbour and airfields fell into Japanese hands, as well as Gasmata in the south, and Kavieng, the capital of New Ireland which also possesses an airfield. Using these as a base the Japanese next attacked the mainland.

The first objectives were the airfields of Salamaua and Lae on the coast, which serve the goldfields in the mountains of Morobe District. Edie Creek and Bulolo river goldfields were discovered by Australian miners shortly after the territory was taken over from the Germans after the 1914–18 war. While under German occupation not much gold had been found there, indeed such unfavourable reports were sent to Berlin that it was decided that it was not worth while to finance any more prospecting expeditions. Nowadays a flourishing colony is settled in the mountains depending almost entirely upon air transport for communication with civilization. The coastal airfields of Salamaua and Lae were both taken by the enemy, as was also Wewak farther north with its airfield and sheltered bay; but so far the Australians have frustrated all attacks upon Wau, which is 40 miles south-west of Salamaua.

The next move was to occupy the Markham valley. The river Wassi or Markham flows by a wide mouth into Huon Gulf, the valley is wide for some distance inland and on the level stretches several small airfields had been made served by New Guinea Airways. Altogether it was a favourable acquisition for the Japanese who occupied it without difficulty. But when their appropriation was complete abnormally severe storms caused devastating floods. In the upper sections of such rivers this is often caused by a fall of rocks damming the beds of torrents until the force of water loosens them, and the pent-up river surges down sweeping everything before it. Some such occurrence seems to have taken place upsetting all the plans of the Japanese, who were washed out of camps and airfields and tumbled ignominiously back to the coast.

By April 1 the valley had been abandoned. A new and determined attempt was next made to reach Port Moresby by land. There had been many air attacks, but again and again the R.A.A.F. broke up formations of enemy aircraft; little damage was reported and many Japanese planes were destroyed. Moreover the Australian forces were ever growing stronger, and the enemy apparently realized that such attacks were proving too costly.

148° 30'
9° 30'
Holnicote Bay
Buna
C. Killerton
Sananda
C. Endaiadere
C. Sudest
Gona
Basaqua
Soputa
Jamburi
Sambogo Ck.
Ambogo
Arehii
Sangara
Agiamabo
Asara
Woida
Koropata
Wiropa
Niumuni
Kumusi R.
Mambare R.
Yodda R.
Kokoda
Mt Scratchley
Mt Victoria
Mt Bellamy
Mt Musgrave
The Gap
Miles
Buna-Kokoda road
Heights in feet

On July 23 large Japanese forces landed at Buna, on the north-east coast of Papua, from which a good track, or road as it is called, leads over the Owen Stanley range to Port Moresby on the opposite coast. Buna Bay is a shallow bight with anchorage for moderate sized craft and sheltered by a small promontory to the east. Light cruisers, destroyers, and smaller troopships anchored there and at Gona in Holnicote Bay, and succeeded in spite of repeated air attacks in landing men and equipment by means of small boats, landing barges, rafts, and canoes. That goffered coast line lends itself to such landings with its myriads of small inlets, two rivers, the Kumusi and Amboga, and its many creeks. A very large opposing army would have been needed to defend such shores. With the Japanese army came their commanding officer, General Tomatore Horii, of great repute as an expert on invasion landing tactics, specially appointed by the Japanese High Command for operations in the South-West Pacific. He was reported to have led his troops in person over the Owen Stanley range, but when they were forced back to Buna Beach he was drowned when his raft upset while attempting to cross the flooded Kumusi.

Within a week of the first landing the Japanese were advancing up the road to Kokoda on the north slopes of the mountains. From Buna the road runs south-west through shore flat, swamp, dry belts of cane-grass, and lower forest to Kokoda in the Northern Division, a Government Station 63 miles from the coast. Better described as a bush trail periodically cleared, this road was originally made to serve a goldfield on the river Yodda. At a much later date the road was continued up the mountains, crossing the range by a pass known as the Gap, and on to Port Moresby. It is the only patrolled road crossing New Guinea from coast to coast. This track the Japanese followed. Held up near Buna for a while by a small Australian force, after they had consolidated their coastal position, they broke through the outer defence line of the Australians who retired towards Kokoda fighting merely delaying actions. For, as the Japanese fanned out in the thick forest, their numerical superiority, together with the bush tactics which they had used so successfully in Burma, threatened encirclement of the defender's little army and gave no option to the latter but to withdraw. So, during August news filtered through to England spasmodically, first that the Japanese had reached Kokoda and taken the Government Station with its tiny aerodrome, next that they had succeeded in dragging armament up the precipitous mountain sides, then that they had forced the Gap and crossed also at other points, and finally came the disquieting news that they had fortified a ridge of the Yorabaiwa range less than 50 miles from Port Moresby. Here their advance was held up definitely.

All this country within reach of the Buna–Port Moresby road is familiar to me through my collecting expedition for the British Museum of Natural History in 1933–34, when I moved from camp to camp on the Owen Stanley range with a base camp at Kokoda. The object of this paper is to supplement with first-hand descriptions of the terrain the very meagre accounts which have appeared in the press. For knowledge of the topography such as one gains by forsaking beaten tracks, cutting new trails to investigate bush, forest, precipices, and swamps, throws light upon many of the military actions that made up that stern struggle.

The Australians under General Blamey, who had utilized those few weeks to the full in mobilizing all resources, counter-attacked with consummate skill, and in spite of overwhelming odds in favour of the invaders fought back victoriously from the mountains to the Buna beaches. And all this was achieved under the most ghastly climatic conditions imaginable, which even evoked from those seasoned troops recalled from North Africa the comment that the fighting in African heat and sandstorms was a mere picnic compared with fighting in the jungles of New Guinea.

The Yorabaiwa range, which was the nearest point to Port Moresby that the Japanese managed to reach, is 2700 feet high and about 12 miles south of the Owen Stanley mountains. Several attempts were made from there to outflank the Australian's outer defence line, but except for taking a few outposts no progress was made. The failure of the enemy to effect new landings in Milne Bay seems to have finally convinced them that they could not reach Port Moresby overland.

Milne Bay is wide with low swampy shores greatly favouring invasion by small craft. But the Australians had foreseen this move and were well prepared. It was a costly affair for the Japanese in boats and men; the small force which did manage to land was wiped out, whereupon part of the land army in the mountains withdrew through the Gap leaving about a thousand, as it afterwards transpired, to hold the Yorabaiwa range until death.

All that forest is very lofty as well as dense on the higher slopes around the Gap. There are thickets of bamboo where a human being can scarcely force a way between the stout stems. Trees support massive curtains of lianes; epiphytic vegetation sends down thick bunches of aerial roots. Overhead are the overlapping crowns of great forest trees. At higher altitudes near the peaks enormous tussocks of moss, some as much as 3 feet across, grow astride the boughs, each tussock supporting its distinctive colony of plants. A large army could filter through such cover undetected, sharpshooters would scarcely need camouflage. But by then the tables were being turned on the invaders. The Australians had thoroughly mastered jungle tactics and could beat them at their own game. Moreover the lifeline to Buna was continuously battered from the air. Transport would be obliged to keep mainly to the road and so was particularly vulnerable to Australian fighter planes which made daring attacks from tree-top level whenever the heavy layers of cloud which hang over the mountains lifted sufficiently.

By then the weather was changing to an intermediate period of instability between the two monsoon seasons. At such times the wind frequently veers round to the opposite quarter several times a day, and there are violent thunderstorms with torrential rain. But between such storms are longer interludes of good visibility than after less heavy rainstorms of longer duration. These short spells, when distance stands out with startling clearness, would appear to have been fully exploited by the R.A.A.F., for when the ridge had been won there were hundreds of corpses bearing evidence of death from starvation as well as victims of direct bombing.

From that time onwards the weather conditions greatly impeded all activities. Rain and mud were often mentioned in reports, the one consoling thought was that the enemy was under the same disability. The severe

Isurava, 3000 feet

Camp on terrace near Orori, 4000 feet

Main range, Owen Stanley Mountains, cloud-filled valley

Kokoda Government Station: from left to right, prison, police barracks, Resident Magistrate's house, and goat pens

storms must be experienced in order to realize how plans can be completely disorganized by weather. In the mountains it is unusual for a day to pass without rain. After only five rainless days I have known the vegetation of open ground dry up completely, climbing ferns and small plants turn brown, filmy ferns and delicate mosses in the deep gullies shrivel, tree ferns droop and turn crimson, while cracks appear in the ground of camp clearings. It is surprising to note the different appearance of the vegetation after only a few days without the excessive moisture to which it is adapted.

During the wettest months rain begins at about 11 a.m. in the mountains, later near the coast, the time varying considerably in different localities. The storm can be heard from a long distance threshing the trees with a sound like breaking waves, and when it approaches the noise is deafening as tons of water descend in an almost solid stream. It quite hurts one's head to be exposed to it: the only time I cover my head is when it rains heavily. After the storm has passed comes another sound, that of falling trees. It might be imagined that being subjected to this prodigal water supply throughout their entire period of growth, the trees would be unaffected, but there always seem to be some that have passed their zenith and the weight of extra water just exceeds the limit they can bear, and down they come. Needless to say such falls are a danger to anyone near, and a sharp look-out must be kept for the warning sounds, snapping of fibres like pistol shots, creaking of boughs, ripping and splintering of the trunk. Once I was within a few yards of a tottering giant of the forest—a most unpleasant experience. It happened very quickly. As I turned the corner of the path, trees at the next corner began to rock and shake their branches violently. As I watched wondering what was the cause a huge tree pitched on to the path, broke in three pieces, and bounced and slid down the mountain slope.

After a storm the whole forest is enveloped in opaque white steam, drawn rapidly upwards until it dissolves leaving a few ragged wisps entangled in branches. In some gullies the steamy clouds seem unable to break away, and many wallow there for hours like white balloons. It can be well understood that capricious weather conditions such as these must have added to the difficulties of the mountain campaign.

Very stubborn fighting took place before the Australians gained the heights, and even when they had the advantageous position of being above and the enemy below there was a prolonged struggle on the northern slopes. It was nearly three weeks before the Japanese were dislodged from their positions among the precipices, some of sticky clay and bare where a landslide has stripped them of forest. The road climbs down very steeply, in some places straight over the slope, or it follows a narrow terrace like a shelf across some of the precipices. The shelves are wider in places, with sufficient space to build a hut or two or for small hamlets such as Orori and Isurava. Not favourable country one would suppose for taking up a defensive position, yet the Japanese were only routed by strong assaults and bayonet charges. When once this was effected they had no choice but to retire on Kokoda.

On the lower mountain slopes there is a wide belt infested with leeches. Some localities are quite free of these pests, others appear to offer the most favourable conditions for enormous colonies. There is no method of avoiding attack

which I have ever discovered, my only weapon of defence against them is a pointed stick with which I scrape them off. They attack legs and feet chiefly, festooning themselves in bunches from one's calves if they are not removed quickly. It is true that they will drop off voluntarily when glutted, but they can be knocked off before starting their meal. If a half-fed leech is pulled away it is as well to be ready with iodine and so obviate the risk of a septic wound; in that climate any wound may be troublesome to heal.

Leeches are guided by scent. It is entertaining to test this faculty, noting at what distance away they are first conscious of the presence of a warm-blooded animal. Where they are numerous one can see them moving forward in waves, flowing over the ground in jerks like a looper caterpillar. My boys and I were free of them in one part of that particular zone because a tree had fallen across the trail and we had to cut a new way round it which naturally baffled the leeches. I was about ten days at one of my camps and when at the end of that time we returned, that loop of the trail, and even the trunk of the fallen tree which we had clambered over, were covered with leeches, poised with head in air waiting hopefully and patiently for us.

Any of the troops who had to linger in that zone or remain motionless in the leech-infested vegetation must have suffered severely. But when once the river is crossed near Kokoda not a single specimen of a leech is seen.

Kokoda Government Station has an Assistant Resident Magistrate and is a sub-station of Buna. It is situated in a delightful position at 1480 feet above sea-level. Opened primarily because of the discovery of gold on the Yodda river, it was found useful to have a police station in that area so it was not closed when the goldfield was abandoned, and the little aerodrome continued to function. As is the case with all these mountain aerodromes in New Guinea, it is a small plain between the ranges. A narrow runway only 100 yards wide and about 300 yards long was formed on a reed-bed kept closely shaved by native prisoners; or if there had not been sufficient crime waves to provide labour then paid labour gangs were provided by nearby villages. Only Fox Moth planes landed there at irregular periods from Port Moresby. It was a decided convenience to receive mail on the day following a steamer's call at the port, rather than having to await the return of carriers sent to the coast at a date when it was hoped that a steamer might arrive, for there was no radio at Kokoda.

The station is on a gravel flat like a raised river bed about 80 feet above the airfield, and consists of a few buildings round a square grass clearing, kept in beautiful order because it was periodically weeded by hand by the prisoners who crawled all over it irradicating every weed. Around it were the Assistant Resident Magistrate's house and goat-pen, police barracks and prison, sergeant's house, rest-house, and a bungalow for the government-owned rubber plantation. This last topped the slope overlooking the little airfield to the north, against a background of violet mountains. At sunset and sunrise for a short spell some of the Owen Stanley peaks are visible as shadowy outlines floating above clouds south of the station clearing. Mount Scratchley, Mount Victoria, and Mount Bellamy are supposed to be recognized; I never verified this. It is a pleasant spot for a base camp, the position and the clearings serve to provide rather drier conditions than those of surrounding

localities. Rain storms driving across the district were frequently diverted to the high peaks. West of the station the river Yodda flows between low banks after a steep course from the mountains. It is a swift stream when fed by torrents during most of the year, but almost dry in some months.

No attempt to use the airfield was made by the Japanese, doubtless they recognized that it was only suitable for certain small aircraft, and they would soon have discovered that familiarity with the mountains and great daring were necessary adjuncts.

At intervals of a day's journey there are small native villages on the road between Kokoda and Buna, each is provided with a rest-house, and the villagers have the obligation to provide carriers as far as the next section. The village constable is responsible and is rewarded with a gratuity of tobacco. Starting at dawn one can be sure of reaching a rest-house in early afternoon.

The first 10 miles after leaving Kokoda are rather flat. Low hills of clay cross the road from north-west to south-east, there are also many small streams. No natural defences present themselves; the Japanese retreated farther before halting at Oivi Creek near the village of that name. There a ten-day battle was fought early in November. The road passes across a gulch, deep and narrow, gouged out of rock by Oivi Creek which leaps down in very picturesque fashion from the hills above. Some 100 feet below the creek still flows among rocks with a great deal of noise. The ridge above was strongly held by the Japanese until the Australians crossed the hill at points on either side, and so surrounded them. They were literally blasted off the ridge and wiped out from their entrenchments both there and on the level ground beyond in the Oivi and Gonari villages, where they also had to be surrounded, a small force at a time. Over five hundred were killed in these engagements.

By the middle of November the Australians had reached the Kumusi river in the Wiropa area. This name (sometimes erroneously spelt Wairopa) is actually pidgin-English for "Wire rope" in reference to a bridge over the Kumusi. The native cradle-bridge of woven creepers has been carried out in the strongest fence iron, with outstanding success. Swinging well above the stream and supported by high strong struts on either bank, it is really one of the most felicitous solutions of the problem of bridging rivers liable to floods. Few structures can resist the sudden weight of water, especially when large trees are brought down by the current. As mentioned before, the Japanese appear to have made full use of this river from its mouth for transport. The Australians were aware of this and the bridge was attacked from the air during the previous months and several times destroyed, thus hindering the enemy greatly until a new bridge could be made.

Wiropa was the site of another struggle, but the Japanese were driven out by November 18, and after a short halt at Awara retreated to the remnant of their army which was in a strongly fortified position on the coastal strip. The Battle of Buna began with the Australian force closing in from the direction of the road, and an American force advancing from the south. By then the north-west monsoon was at its height, and the Battle of the Buna flat was fought out under conditions of extreme discomfort which could hardly be exceeded. From November to the middle of February are the worst months of the year, and whereas in the mountains there are spells of a few hours'

duration of relief from the trying climatic conditions—fresh breezes blow on the heights, clouds lift, a stream bubbling out of the ground may be moderately cool—there is no respite in the dense bush of the low-lying land. Added to the strain of that exacting type of warfare was the oppression of extremely humid atmosphere. The relative humidity during those months is 92 per cent. and this is increased occasionally. Bouts of malaria are very prevalent. The Australians seem to have suffered greatly from fever. In their case it would probably be increased by the difficulty of maintaining a well-balanced diet. Fresh salads, fruit, milk, easily digested vegetables, would be practically unobtainable. Bully beef and rice are the worst diet in times of fever, and these must have formed the greater part of their food because they are so easy to transport. Fighting in slime and dripping foliage day and night exposed to violent storms of rain, never dry except for a limited period after changing into a fresh suit, never clean except for a still more limited time after a bathe, always perspiring and sticky. This is what the soldiers had to bear in addition to the usual sufferings of warfare.

It used to be an ordinary procedure to change my pillow slip twice during a night when I had an attack of malaria. While working in the forest it was usual to change my shoes three or four times and my bush suit at least twice a day if near enough to the camp. These alleviations of discomfort were of course impossible to fighting men. The temperature is scarcely lowered at night, and when from sheer exhaustion sleep might come it is prevented by attacks of vicious little *Diptera* belonging to several different groups, which pass through the finest mosquito nets. In the mountains and especially near water, species of *Simulium* make some districts unbearable. I have known my Papuan boys cry from weariness and irritation during attacks by these tiny black flies which stab like pricks from a needle. There are other little flies equally bloodthirsty. On the Buna flat there is no escape, no part is free from them. If one seeks the seashore where cool breezes may come off the water at night there are obnoxious insects, loosely termed sand flies, belonging to different genera which attack in millions from the dry soil.

The secondary forest near clearings gives way to large areas of swamp after Ambago, of slow creeks, grey stretches of smooth mud, characteristic swamp vegetation, bushes, mangroves, tall ferns, and palms. To pass through the swamps in the wet season requires good native guides, and even they are often at fault. The opaque, purple slime may be ankle deep or over one's head, the only safe path is on the top of mangrove roots when the trail peters out as it has a habit of doing every 20 yards. Crocodiles may be met with in any creek, and may be seen lying flat on the warm mud. Snakes are there too, not the most poisonous, but large, gaudy boas, sleeping in a twisted knot on high boughs. Giant lizards stalk their prey of fish. It is a weird and sinister landscape in peculiar blue-green twilight; no bird song, only harsh cries and the plop and scuttling of millions of crabs. Swarms of large, fierce mosquitoes attack day and night, working in shifts with not an hour's break between. The Australian soldiers were fighting the Japanese in these swamps.

Buna district is partly in a dry belt which even in the wettest months offers comparatively dry conditions in sharp contrast with the sodden, waterlogged ground elsewhere. The dry belts on Papua present a curious anomaly in the

Bamboo thickets, 8000 feet, Owen Stanley Mountains

Forest near Kokoda

Government rubber plantations, Kokoda

Edge of the forest, young leguminous trees, bamboos, and coarse grasses

Mangrove swamp

excessively humid climate. There are two of these areas, one near Port Moresby 100 miles long reaching to opposite Yule Island, the other a 30-mile belt south-east of Buna. It is a curious experience to leave the drenched forest, especially during the wettest months, and without gradation enter country of a totally different nature. From swamp or wet forest, the streams bordered with filmy ferns and other rain-fed plants, one plunges into tangled jungle of fine bamboos and coarse grasses waving 8–10 feet overhead. The surface of the dry ground, with gaping cracks, is covered with layer upon layer of matting formed by rhizomes and clumps. It is tiring to walk upon and one of the most difficult types of ground to clear. The forest is Australian in character, much eucalyptus and small, tough bushes. Australians say they could easily imagine themselves to be in the dry tracts of Queensland.

The existence of these dry areas in New Guinea has been accounted for by the alignment of the mountain ranges. Where rain-laden clouds coming inland from the sea are carried by wind parallel with the ranges they pass on unbroken until met by mountain masses in their routes, where the rain is precipitated in violent storms. This explanation is not universally accepted, but appears the most feasible. Certainly when on these dry tracts heavy storms can be seen passing over to hurl themselves at the highest peaks. In Port Moresby, which is in the south-west dry belt, the annual rainfall is 32 inches; there is acute water shortage in some months, so that it has been necessary to make a cement catchment reservoir in the hills above the town. At the farther end of this dry belt Kikori Government Station near the high peaks has an annual rainfall of 232 inches.

These dry areas are not to be confused with those produced by human agency. These latter are met with where the native population has deserted territory once occupied by their villages. To make a village clearing the ground is frequently thoroughly burnt over, and stubs of trees uprooted and burnt, and in the case of a vigorous community the ground is kept bare by constant burning. When such villages are deserted the area is taken over by grasses, and trees and bushes of quick growth. It is considered by some botanists that these areas will never be re-forested, or at least not so densely forested as they were previously.

Large coconut plantations, belonging to the Government Station of Buna, and the Anglo-Catholic Mission Stations, lie in the north-west section of the wide coastal flat beyond the dry area and the largest swamps. Seaward fringes of low scrub demarcate the beach, rocky in places but chiefly sandy; the vegetation is characterized by the blue-green, drooping branches of *Casuarina*, or impenetrable strips of *Pandanus*, or the beautiful yellow-flowered *Hybiscus tiliaceus* humming with large black bees.

It was the gargantuan task of the Australians to throw out the invaders from almost every yard of this terrain: swamp, dry belt of cane and grass, hills, creeks, three rivers, clearings, villages, coconut plantations, dense thickets, and groves of high trees.

During the five months since their first landing the Japanese had fortified 12 miles of this coast to about 4 miles inland. From subsequent descriptions of the fortifications it is manifest that the area had been prepared with great thoroughness, in anticipation of using it as a permanent base for operations in

Papua. The ground was mined and traps were laid of every conceivable device. Every advantage had been taken of the various types of natural cover to form a network of defences. Hillocks, bush clumps, and belts of tangled vegetation became hedgehogs of defence, each a small fortress, the approach covered by sharpshooters concealed in high trees. Pill-boxes or bunkers 18 feet deep, the walls reinforced with logs, other strong machine-gun emplacements covered in soil and coconut fronds, were connected up by trenches, and were proof against small arms and mortars, so that the defenders need not expose themselves while anyone approaching came under a withering fire.

This position was backed by the sea, from which it was known that reinforcements had been landed from time to time. Some of these landing parties had been vigorously attacked from the air and dispersed or annihilated. Large numbers of men had been killed, yet still large forces had got ashore in small craft. With Rabaul and Salamaua in Japanese hands, those waters were only open to attack from the air, and for a while such attacks had to be based on Port Moresby. Later, when new temporary airfields had been constructed within a few miles of the coast, the air operations could be conducted with greater precision, but in the first phases of the battle the position was in favour of the invader.

In the first month the Japanese had been engaged upon a new airfield in addition to the coastal strips which had served Buna and Gona as airfields for so many years. This new airfield was abandoned without being completed, presumably because of shortage of aircraft. Prodigious losses in the Solomons, where 220 planes were destroyed in two months by the U.S.A.A.F., must have affected the position in Papua.

Frontal attack on the Japanese fortifications proved ineffective; the whole area had to be dealt with piecemeal, literally yard by yard, the Gona half by Australians, the Buna half by their American allies until they could join forces. The one weakness of the Japanese army was that they had fortified their position to face inland, but the U.S. troops succeeded in driving a wedge first through to the coast between the Buna Mission and Giropa Point. These tactics were repeated and so flanking attacks became possible. The Australians occupied Gona, and later the Americans took Buna. By direct infantry assault, bren guns, and flame-throwers, the ground was slowly cleared. Tanks landed in Milne Bay and brought overland with great difficulty were successfully used on level clearings such as the coconut plantations south of Cape Endaiadere. Trenches and pits were attacked individually by heroic bayonet charges, "winkling" the Australian soldiers called it, and by throwing burning logs soaked in paraffin to smoke out the enemy. After six weeks of this ghastly warfare only pockets of the enemy remained, the last to hold out being at the mouth of the Kumusi river and on Sanananda Point. Finally every enemy was accounted for.

During the whole campaign it was evident that the Japanese troops had been instructed to die at their posts rather than give themselves up as prisoners. A remarkable incident occurred in the Solomon Islands, when a small force was overwhelmed on a beach. Eye-witnesses described how the Japanese soldiers seeing escape impossible plunged into the sea and swam away from the shore; the majority were drowned.

Buna plain, inhabited area, fortified with gun emplacements by Japanese

Dry area, Buna plain, eucalyptus trees and grasses

Buna plain, bush and young coconut palms

Secluded beach suitable for Japanese landings

Kumusi river

Secluded beach suitable for Japanese landings

Secluded beach suitable for Japanese landings

Kumusi river

Secluded beach suitable for Japanese landings

Those who know the Papuans well ask how they are likely to be affected by the fighting in New Guinea. Without doubt some impression must be made by events which disrupted their own village life. Had their white masters been permanently driven away by the Japanese probably the prestige of the white race might have suffered. For those individuals who until now could wander about alone in the interior of New Guinea with impunity did so through the position which white men hold in the minds of these primitive people. But locally the glamour of Japanese successes would be obliterated by the subsequent treatment of Papuans by the invaders. For example, in New Britain the natives saw white men defeated by superior numbers, but when Buna was retaken some natives of New Britain were liberated who had been brought away as slaves. Such instances of ill-treatment will prejudice generations of Papuans against the Japanese, for while held as slaves these natives had not been adequately fed and these are unpardonable crimes. The Papuan knows well that such injustices could not take place under British Administration; if he were stolen from his home or underfed he would not hesitate to lay his case before the nearest magistrate.

When war on Germany was first declared, a deputy of Papuan police went to see the late Governor of Papua, Sir Hubert Murray, to request that they might enlist in the British Army. He greatly appreciated the loyalty that prompted this spontaneous gesture, but explained to them that even if they could stand the strain of modern warfare they would not be able to exist in another climate. When war actually came to them in their own country however they seem to have rendered invaluable aid to the Australian forces although taking no active part in the fighting. We hear of them as transport carriers and also as stretcher-bearers carrying wounded to field hospitals whence they were air-borne to Port Moresby. When supplies were dropped by parachute the Papuans derived huge enjoyment from this new game of locating them in the bush and carrying them to camps. They were also engaged in making clearings, building huts, and other such work which they understand and enjoy. From all one hears the Papuan has not fallen below our estimate, but has acted up to his reputation for cheerful and ungrudging cooperation in this first phase of the war in New Guinea.

DISCUSSION

Before the paper the PRESIDENT (The Rt. Hon. Sir GEORGE CLERK) said: The scene of the recent operations against the Japanese invaders of New Guinea is familiar to very few, and probably the reader of the paper this afternoon is the only person in England who has camped for months in the country between Buna and the Gap in the Owen Stanley range, where the fighting has been so difficult, and the accounts of it are not easy to understand. Miss Cheesman has naturally followed the reports of operations with minute interest and the great advantage of knowing the country well, and she will, I am sure, be able to interpret a great deal that is obscure in the story of these operations.

Miss Cheesman then read the paper printed above.

The PRESIDENT: I am sure you will all agree with me that we owe a debt of gratitude to Miss Cheesman for bringing home the nature of the country over which the Americans and the Australians have had to fight. As she pointed out,

it is almost incredible that such a strain can be borne day after day and week after week. We can now realize when we read the scanty accounts we are allowed to see of campaigning in New Guinea, that however terrific and terrible is the fighting in Russia and in the deserts of North Africa, for sheer difficulty and, I use the word, guts, the fighting in New Guinea yields to none. I am sure we are grateful to our lecturer for helping us to realize that and for a most interesting afternoon.

ARCHAEOLOGICAL SITES IN THE WESTERN ADEN PROTECTORATE

MAJOR THE HON. R. A. B. HAMILTON

SOUTH-WEST ARABIA has been a link in the trade between the Mediterranean, the East, and East Africa; the objects of archaeology in South and South-West Arabia must therefore be primarily concerned with the investigation of its ancient trade route. Of the details of the history of the country little is known. But the main historical trend is clear and it is the object of these notes to give a brief description of it and of the archaeological field as it lies to-day. A comparison of these two, the historical trend and the archaeological field, should give us a good idea of what the archaeologist may expect to find. For the purpose of this paper it is unnecessary to concern ourselves with exact dates even when they are known, for from the geological formation of the country to the present day, few parts of the world can have had so simple a history, or one so obviously dependent upon geographical position and topography.

The archaeologist must regard the country not as a source or an outpost of civilization, but as a link between the Mediterranean and the East. The broad trend of its history is that of a trade route and the archaeological objective will be, not the discovery of a civilization, but the discovery of data for our study of the diffusion of culture between civilizations. Let us look at the trade route in its entirety. The only thing of value to the ancient world which the country itself produced was incense, and this may well have had a wider distribution some thousands of years ago than it has to-day.

The first archaeological period of the country can be taken to extend from the earliest times until the second millennium B.C.

The second millennium B.C. saw a considerable development of shipping in the Indian Ocean. With it the land trade through South Arabia expanded. The topography of the country is clear and its effect upon the trade route obvious. To whatever dhow port on the southern or south-western coasts the shipping came the configuration of the country will have forced the caravans into one main route. Caravans could cross neither the precipitous Yemen mountains nor the waterless Southern Arabian desert, and so, keeping close to the north-eastern slopes, they passed through the comparatively well-watered areas where the mountains drain into the desert. We may call this, provisionally, the second archaeological period of the country, that is, from

the second millennium B.C. until the second century A.D. This period covers the rise of the ancient kingdoms of Southern Arabia to their zenith. There are in this period not only questions of diffusion to study but a long history of the development of the divine kingship, that of Saba. Side by side with this divine kingship we have the peculiar system of government of Ma'an, probably an earlier kingdom, ruled by a Grand Council and not by a king. During the later part of this period South Arabia was closely associated with Abyssinia, the capital of which was at Aksum. In the second and first centuries B.C. the theory of the monsoon winds became widely known, and in this knowledge lay the seeds of the decline of the land trade route.

The third period from A.D. 200 until the fourteenth century is a period of decline; the old kingdoms, after a short time of unity under Himyar, disintegrated economically and socially. The rise of Islam brought with it no benefits other than spiritual. Rather it led to an exodus of the Yemen's best and most adventurous blood, it destroyed the ancient shrines, and closed the country to foreign contacts. From the rise of Islam until about the fourteenth century the archaeologist can expect to find little of interest.

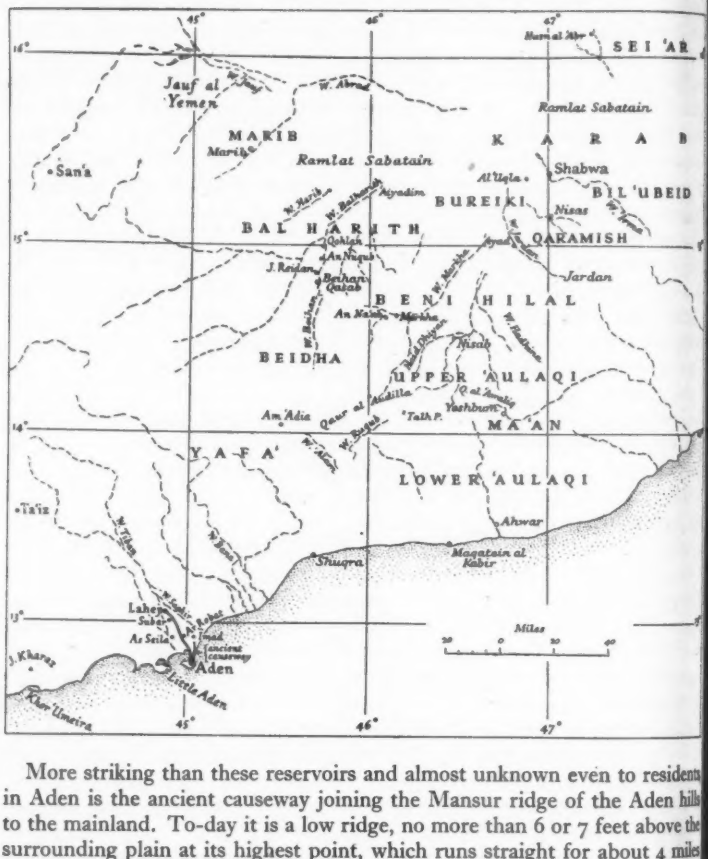
From the fourteenth to the seventeenth century the country appears to have experienced something in the nature of a Renaissance. This was the age of the ports and of coastal industries. To this period we can assign the coastal glass factories and study of this period is essential to the anthropologist's understanding of the condition in which the tribes are found to-day. We may properly call this our fourth archaeological period, and it brings us to the period of modern history.

The purpose of this paper is to describe the archaeological field as it is to-day, with reference, where such is possible, to these archaeological periods. Only one archaeologist (Miss Caton Thompson) has ever excavated in the territory, and she for only one short season, when her work included a temple site, tombs, irrigation, and pre-history in the Eastern Protectorate. All other investigations have been done by amateurs. The amateur, however careful he is or however knowledgeable he feels, works under a grave handicap: the feeling that he ought not to be working at all. Moreover, the amateur's conclusions and indeed his whole work are suspect. It is right that this should be so. For all practical purposes, therefore, the country can be said to be archaeologically unexplored and such opinions as are expressed in these notes must be considered to be those of an amateur, who with a fair grasp of the little that is known of the history of the country has only one object in view, which is to stimulate the interest of British archaeologists in South-West Arabia; for without their work anthropologists, and consequently officials, will be at a disadvantage. Only after such an explanation is the amateur entitled to express an opinion.

Let us consider Aden itself first and then move northwards into the delta of the Wadi Tiban, through the hills into the Nisab triangle (*Geogr. J.* 100 (1942) 110), and thence to the north-west into the district of Jauf al Yemen. This route, with a few excursions of interest, will give us a fair cross-section of the field under review.

In peace time few travellers stop at Aden without seeing the Aden tanks. These are a system of reservoirs, and on their discovery they were, most

unfortunately, not scientifically excavated, and were repaired very thoroughly, so that no evidence remains by which they can be dated. The Yemen contains greater reservoirs, but this is the largest system so far known in the Protectorate. It was built at a time when the wells of the peninsula did not suffice the population and this will have been when seaports and sea trade were flourishing. We can therefore confidently assign them to the third archaeological period. They have been so thoroughly repaired that it is doubtful if investigations in their vicinity would be worth while.



More striking than these reservoirs and almost unknown even to residents in Aden is the ancient causeway joining the Mansur ridge of the Aden hills to the mainland. To-day it is a low ridge, no more than 6 or 7 feet above the surrounding plain at its highest point, which runs straight for about 4 miles from the foot of the Mansur pass almost to the mainland village of Imad, up the length of the Khormaksar isthmus. The isthmus on either side of the causeway is alternating sand and salt-marsh, the sand being thickly strewn with sea shells. To-day it is little used, and indeed there is little reason for its use, since the isthmus is wide and, on most of its surface, good firm going. Its obvious purpose will have been to cross ground covered at high tide, and

it must therefore date from a time when the isthmus was at a level about 5 feet lower than it is to-day. Such a work could only have been undertaken at a time of social cohesion and prosperity, and at a time when the seaport of Aden had considerable importance. It may therefore date from the building of the reservoirs, in the fourth or fifth century A.D. One must not however forget that it is likely that the port of Aden may have had importance at a very much earlier period, and I incline to the view that the causeway is far older than the tanks, and may well be found to date from the earliest times, when Egypt traded with Punt. It is to my mind the most tempting site in all South Arabia and the one most likely to give surprising results, and of one thing we may be certain, that it was built when Aden was an island and not a peninsula. It is also the most convenient site, since it is within the British Colony, where law and order reign and labour is cheap and plentiful, and it offers an interesting winter's work.

At the northern end of the causeway there are some mounds of rubble standing in salt-marsh, and it is surmised that these are the ruins of buildings connected in some way, and perhaps as guard houses, with the causeway. Coins found by natives in this area, but not in the sites themselves, are of both the common types found in South Arabia, those with early arabic inscriptions and copies of Greek coins bearing the head of Pallas Athenae on one side and on the other the owl and the overturned amphora. Numbers of both these types of coins have been found over the whole coastal plain north of Aden, the Arabic ones usually being in small pots with a thick green glass glaze.

We next come to the mainland glass factories. The principal one is about 15 miles north of Aden at a hill called As Seila. Glass debris on the surface here has been dated fifteenth or sixteenth century and consists of fragments of small jars and bangles of a highly decorated type. The mound is about 30 feet high and covers about 2 acres of ground. Other smaller mounds and portions of walls surround the site, and there are a number of ruined retorts full of glass and slag. An Arab coin of the fourteenth century was found on the surface in 1932. As Seila is one of a number of similar sites and no attempt at excavation has been made on any of them. Until excavation proves otherwise, we must assign these sites to the last archaeological period.

The delta of the Wadi Tiban contains relics of great interest. I have dealt with the glass factories first, because their surfaces give a clue to their period. Flight-Lieutenant Rickards, whose powers of observation were acute, reported in 1932 that some sand dunes near the Aden–Lahej motor track appeared to him to be darker and straighter than other dunes, when observed from the air. A reconnaissance on the ground confirmed the position of these dark dunes and it was found that, whereas the ordinary dune moved to the north-east during the summer monsoon, these dark dunes remained stationary. Further examination brought both Rickards and myself to the conclusion that these dark dunes had the characteristics of archaeological remains. They enclose and occupy a considerable area, their north-east corner being at the village of Subur and their outer perimeter running thence south-east to the banks of the Wadi Saghir and south to Ar Robat. Some of them are of considerable height and one was estimated to be at least 20 feet high for a distance of close on a mile and very narrow.

One is left with little doubt that they mark the limits of a large settlement. From Subur and running east and west for some 4 miles are other dunes. These are composed almost entirely of pottery, the long mounds of broken fragments being between 20 and 30 feet high. The pottery is unglazed and unpainted and ranges from thin somewhat brittle ware to stout fragments an inch thick; all is somewhat crude and primitive. During 1917 Subur was advanced Turkish H.Q. and the Turks sank a shaft into the largest dune there 40 feet in depth. They declared that at that depth they were still digging in broken pottery of the same type as is visible on the surface.

These pottery dunes and the dark dunes present an intriguing problem. The Wadi Tiban is a perennial stream and it divides into two north of Subur, forming a delta which must always have been attractive as a settlement. From surface evidence one cannot assign these delta remains to any particular period, beyond saying that there is no reason against their inhabitation from the earliest times. The land is fertile and has always been well watered and historically one would expect to find there, as it were, a cross-section of the history of the country, from the earliest inhabitants before the expansion of shipping, through the rise and fall of the Kingdoms to the artistic period of the Renaissance. The truly astonishing extent and depth of the pottery dunes in itself calls for some explanation.

Westwards from Aden there are remains of reservoirs in the peninsula of Little Aden. Examination of this site might give a clue to the date of the larger Aden reservoirs. Sixty miles farther to the west is the dhow anchorage of Khor al Umeira and in the extinct volcano of Jebel Kharaz there are similar remains, much covered with debris. The history of the coast, however, will probably be found in the delta of the Tiban.

Sites in the hills north of the coastal plain and between it and the desert are few and of little interest. One however, that of Am 'Adia on the 'Audhali plateau at about 7000 feet, is worth examination. It consists of a series of strong walls and terraces built on the side of a round-topped hill. There are the remains of buildings and of one principal building, bearing the only inscription at present visible, the letters being of Phoenician type in bas-relief. Translated this inscription means "Yafa' is great." Yafa' is the name of one of the largest confederations of tribes in the Aden Protectorate to-day. Below these buildings is a large water reservoir in fairly good condition. One can confidently assign this to the later part of the second period, and it has, as yet, not been touched, the local tribesmen regarding it with awe.

We come now to the northern slopes of the south-eastern spurs of the Yemen mountains. To these spurs all caravan traffic on the land trade route from Southern Arabia to the Hejaz and Mediterranean must have been confined, except the farthest west caravans which chose to struggle up the Tihama. The ruin field here is very considerable, and to describe each site would be beyond the scope of this paper. It will be best to give a general description, noting those sites most likely to give the best results.

The whole extent of the ruin field, from the temples of the Eastern Protectorate to the ruins in the district of Jauf al Yemen, can be assigned, by the evidence of inscriptions, to a time from the later half of the first period to the earlier part of the second, up to the rise of Islam. The earliest inscriptions

are within the first millennium B.C., and they show a country having considerable wealth and a high degree of social organization. The prosperity of the country seems to have increased steadily until the fourth or fifth century A.D., although the causes of its decline were present earlier.

For sites north of the Aden Protectorate boundary the reader is referred to descriptions given by Mr. StJohn Philby.[1] The most interesting sites south of the boundary are as follows: In the foothills of the Haid Dhiyan we find perhaps the most interesting system of hill aqueducts of which trace remains to-day. They probably date from the first and second centuries A.D., but portions of them may be considerably earlier. To describe them briefly one may say that they consist of V-shaped channels cut in the sides of the hills, so that rainwater was collected in these channels, carried into aqueducts, and thus taken out to the fertile land beyond the hills, in the direction of Nisab. These channels were carefully sited and plaster-lined and will be of great interest to anthropologists. It should be possible to make a rough estimate of the population in ancient times by studying such systems of rainwater irrigation. The Arab to-day is content with the wadi bed as his aqueduct, and loses two-thirds of the rainwater in consequence.

Below the northern spurs of the Haid Dhiyan lie Markha to the north and Nisab to the east. This is a rich ruin field, but particular attention should be paid to the big walled site of An Na'ab in the Markha district. The local Seyyids have stopped all treasure hunting among the tribesmen, after a number of murders were committed for a statuette, supposedly gold, of a bull, which was washed out of the ruin by flood. Next to Qohlan, by the wadi Beihan, An Na'ab is the largest single site in the Protectorate.

South of Nisab lies the hill ruin of Mariba. Attached to this is an unlikely legend, but one so interesting that it should be given its place in any account of the district. It was first officially heard of when the Sheikh of the district wrote to a British official asking for a surveyor to be sent to assist the tribesmen to find the spring sources, in order to put the ancient system of aqueducts and hill channels into use again. The writer claimed Government assistance, since he said that it was a British Army which in ancient times had come to the hill from the north, and having stayed there a few days withdrew after breaking the aqueducts and blocking the springs which fed them. When he was told that no British Army had ever invaded the country he replied that in any case it was a northern army of Ahl Fareng. The interest lies in Strabo's report of the invasion of the country by Aelius Gallus in about 27 B.C. In this it is stated that his forces reached and invested the city of Mariba. This was his farthest south and it is stated that after seven days he gave up because of lack of water and began his retreat: "It was not by war; but by disease, toil, hunger, and the hardness of the road. . . ." I am assured by anthropologists that it is beyond the bounds of possibility that there is more than coincidence in the similarity between the legend and the report. I can only reply that other names such as Harib, Beihan, and 'Amd have survived the centuries and that if names survive, so may at least some facts attached to them. The ruin lies near the modern settlement and well of 'Ain ar Rasas.

There are ruins of considerable interest in the mouth of the Wadi Jardan.

[1] H. StJ. Philby, "The Land of Sheba," Parts I and II. *Geogr. J.* 92 (1938).

From the ancient fort guarding the entry from the desert into this wadi has come a 5-inch bronze statuette, since identified as Greek of 600 B.C. This was washed from the ruin by rain. Similar sites exist in the Wadi 'Irma.

Shabwa has already been fully described.[1]

The Wadi Beihan is full of interest. There is the ruin of a dam at Al Qasab and between there and the great ruin of Qohlan lie a number of lesser sites, including the small walled site of Hajar. Above Qasab rises the steep pointed hill of Jebel Rëidhan. On the shoulder of this is the ruin of a small settlement and of a water cistern. The smooth top of the hill is reached through a plaster passage which has been built on to the side of the hill and is still strong and in use. No inscriptions have been found on the hill.

Between the villages of An Nuqub and As Seilan lies the ruin of Qohlan. It is most imposing and contains at least two long inscribed stelae. It has been little touched by plunderers and the surface can be said to date from the second century A.D. There can be little doubt that it was an inhabited town of importance. To attempt a description of it from memory would not be fair and it suffices to say that in extent and in the appearance of interest it far excels the ruin of Shabwa. From evidence of primitive clay and alabaster statuettes found there by the tribesmen I suspect it to have been a town of considerable antiquity in the beginning of our era and, unlike Shabwa and indeed Jardan, it lies on the route which large caravans would naturally take. Between it and Markha lies the ancient well of Bir Dhumma', a square-mouthed well which is a rare type to find in South Arabia.

North-west of this ruin, known locally as Qohlan, lies the Wadi Harib, in itself an extensive ruin field. Some Ma'ani inscriptions have been collected there, but most refer to the kingdom of Qataban, the third of the three most ancient kingdoms, the other two being Ma'an and Saba. Those inscriptions already examined in Qohlan are also Qatabanian. These puzzles await the spade.

To sum up the possibilities of this archaeological field as it appears to-day is not within the scope of an amateur's paper. The two principal objections to sending an expedition into the country are, first, that the civilization of South Arabia was a borrowed civilization and has no unique characteristics, and, secondly, that the country is unpacified and that the opening by foreigners of the surface of mounds, long connected in the native mind with legends of buried treasure, is likely to lead to strife.

The first objection is patently absurd. Civilization does not sprout of itself in a vacuum, as it were. It is diffused by contacts. No civilization can be accepted as unique until we are certain that it existed alone from its beginning, completely isolated from all contacts with the world outside it. No such civilization has yet been found. To a large extent any search for such a civilization must be a search for contacts and thus we must neglect no field which may add to our knowledge of the mechanism of diffusion, whether we are diffusionists or not. In the civilization of South Arabia we are presented with a picture which is at once limited by geography. The geographical position of the country and its topographical structure limit both its contacts

[1] H. StJ. Philby, "The Land of Sheba," Part II. *Geogr. J.* 92 (1938). R. A. B. Hamilton, "Six Weeks in Shabwa." *Geogr. J.* 100 (1942).

and their mechanism. Except for the incense, contact must be by sea and must depend upon the capabilities of ocean-going shipping. When contact by sea with the East has been established, the topography of the country limits trade to one main route. Not only does this simplify our search for contacts, but it may well provide unique data for our study of the mechanism of diffusion, in particular since those living in the country to-day are the direct descendants of those who made the ancient kingdoms.

The second objection, the social instability of the country, is serious. It is an unfortunate characteristic of all explorers, whether scientific or otherwise, that the more inaccessible the objective the more attractive it becomes. This has led people in South Arabia to neglect the wonders on their doorsteps and to risk their lives and their money in attempting to be the first to visit such sites as Shabwa. Excavation anywhere on the coastal plain would raise few political difficulties, and while we may be disappointed in finding much of recent date we may well find that the deltas of the perennial streams contain the earliest as well as the latest evidences of civilization. That the dark dunes and the pottery dunes of the Tiban delta contain evidence of a Renaissance in comparatively recent times is only an amateur theory and has for its foundation the scanty evidence of the surfaces of the most obvious sites. These lowland sites, where a peaceful atmosphere prevails and the cooperation of the people can be assured, and where labour is controlled, cheap, plentiful, and intelligent, are the obvious places in which the archaeologist should begin. Apart from other advantages, once the people of the coastal belt have assured themselves of the innocence of the scientist's intentions the wilder tribes of the hills will be more ready to put up with him.

It is hoped that these facts and theories, thin though they are, will encourage British scientists to take active interest in this field after the war.

THE MOVEMENT OF POPULATION TO AND FROM CAMBRIDGESHIRE BETWEEN 1851 AND 1861

H. C. DARBY

ERNEST RAVENSTEIN, writing in 1885, found that the movement of population in England during the nineteenth century was characterized by the fact that it took place in short-distance stages.[1] The phrase "transference of population from the south and east to the north and west" was seen to be no more than a generalization that covered up a most complex motion. The existence of this short-distance movement was recognized by many, and Marshall himself summarized it clearly.[2] But it was from the pen of Mr. Arthur Redford that the generalization received closest examination in a remarkable book published in 1926, 'Labour migration in England 1800-1850.' This illuminating study must claim the closest attention of all geographers with historical leanings. His thesis is that "the great majority of the migrants went only a short distance, and migration into any centre of attraction having a wide sphere of influence was not a simple transference of people from the circumference of a circle to its centre, but an exceedingly complex wave-like motion. . . . The movement of population persisted over a wide area, even though most of the migrants did not make any long journey" (pp. 160–61).

Mr. Redford's book demonstrated what an immense body of material lies in the Census Returns, material that has so far only been nibbled at by historical geographers, and the historian has been nearly as laggard as the geographer. Not until the full details of these Returns have been mapped can an authentic picture of nineteenth-century Britain be given. Thus, from 1841 onwards, data relating to the birth-places of people are available, and provide the material for an analysis of that movement recognized by Ravenstein and discussed by Mr. Redford. The way has been pointed clearly enough. Mr. Redford gave seven maps, but many hundreds could be drawn, and, were these extended to include the period after 1851, the modifying influence of rail transport could be gauged, and it may well be that the generalization would have to be modified for particular counties and particular periods. But these are wide questions; here I wish simply to consider, for the decade 1851–61, the case of Cambridgeshire (a fair sample of an agricultural county) and its reactions to the industrialism of the nineteenth century. The Census Returns could be supplemented by miscellaneous evidence from non-statistical sources. That evidence has not been set out in this note which is purely an exercise in the handling of Census material.

Census of 1851

There is one caution to be made. Two units must be considered in 1851; not only the geographical (or civil) county, but in addition a strange unit—the registration county of Cambridgeshire. The difference between the registration

[1] E. G. Ravenstein, "The laws of migration," *J. R. Statist. Soc.*, 48 (1885) 167–235.
[2] A. Marshall, 'Money, credit and commerce,' p. 8 (1923).

and the geographical county is considerable.[1] The registration county included a large part of Norfolk north and east of Wisbech, stretching to King's Lynn and the Wash, and also a part of Suffolk east of Newmarket. It excluded a large area in the upper valley of the Cam from Ashwell down to below Foxton, and another area around Thorney. And there were also many smaller differences. The compilers of the Census drew attention to the "inconveniences and perplexities" of the variety of units into which England was divided for different purposes. They ventured to suggest that "the comparison of statistical facts of every kind, and probably all administrative arrangements, would be greatly facilitated by the adoption of a uniform system of territorial divisions in Great Britain." That subsequent changes were made in the presentation of the Returns however does not always make it easy to obtain figures that are directly comparable for all the decades between 1851 and 1901.

Unfortunately, the Returns for 1851 raise a peculiar problem for they provide figures to show how those born in *civil* counties were distributed throughout the *registration* counties of England and Wales.[2] As the boundaries of the civil and registration county of, say, Cambridge did not agree, it is impossible to obtain accurate information about the distribution of the Cambridgeshire-born in bordering counties. Thus, it is misleading to read that 6849 people born in civil Cambridgeshire lived in the registration county of Huntingdon, because the boundaries of registration Huntingdon included a portion of civil Cambridgeshire. In this instance therefore the number of the Cambridgeshire-born does not represent migration from Cambridgeshire to Huntingdonshire because it included the inhabitants of those Cambridgeshire villages that formed part of registration Huntingdon. For this reason we cannot use the Census Returns of 1851 to show either immigration or emigration on a county basis.

There is one type of map however that can be drawn for 1851, because the Returns also give a set of more detailed tables showing the number of people born in civil Cambridgeshire and living in each of the 623 registration districts (or Poor Law Unions) of England and Wales. Except for those districts that involved overlap between the civil and the registration county, Fig. 1 gives a picture of emigration from the civil county of Cambridge. The districts involving overlap are marked with a query. This map emphasizes the extremely short-distance nature of the movement. The nearby districts stand out as great receivers of the Cambridgeshire-born. Beyond these nearby districts, the outward migration lessened in intensity until occasionally a few remote active centres of attraction were reached.

Census of 1861

The decade 1851–61 was a critical one for Cambridgeshire. After half a century of more or less steady increase, the population of the county declined.

[1] The area of the civil or geographical county was 525,182 acres; that of the registration county was 571,758 acres.

[2] Table xxxix (pp. ccxc–ccxcvi) of Part II, vol. i, of the 1851 Census (London, 1854) shows birth-places, but it gives no indication of this confusion. The contents of Table 26 (p. clxxxii), together with the titles to Tables 23 and 24 (pp. clxxvi–clxxix), show however that the data of Table xxxix refer to numbers born in civil counties but resident in registration counties.

per 10 000 acres
40 and over
4 " "
The boundaries of registration districts are not shown.
per 10 000 acres
40 and over
4 " "
The boundaries of registration districts are not shown.
Scale of Miles
0
20
40
60
80

The following figures give the intercensal rates of increase for the registration county; the corresponding figures for the civil county do not differ very much from these. The rate for England and Wales as a whole is given in brackets.

1801–11 ..	.. +15%	(+14%)	1851–61 ..	.. −5%	(+12%)
1811–21 ..	.. +21	(+18)	1861–71 ..	.. +6	(+13)
1821–31 ..	.. +18	(+16)	1871–81 ..	.. −0·4	(+14)
1831–41 ..	.. +14	(+14)	1881–91 ..	.. +3	(+12)
1841–51 ..	.. +13	(+13)	1891–1901	.. +2	(+12)

From plus 13 to minus 5 is a considerable drop. The footnotes that accompany the 1861 Returns tell their own story. One of these says: "The general decrease of population throughout the District of Caxton, and especially in the parish of Caldecote, is mainly attributed to emigration, and migration, owing to the lowness of wages, etc." Similar causes helped to account for a decrease in many other villages in the county. The reason stated was sometimes "emigration," sometimes "migration of labourers to towns," or to "manufacturing districts," or to "London and the North of England," or to "Manchester and its vicinity," or, again, to "the metropolis and other large towns."

These Census footnotes imply direct movement to comparatively remote centres, and if this implication is true, what of the "short-distance theory"? How far is it applicable to conditions after 1851? Fig. 2 shows the distribution in 1861 of emigrants from the civil county of Cambridge to other parts of England and Wales, and it is calculated on the same basis as Fig. 1. Within the decade the distribution of Cambridge natives has become somewhat more extended.[1]

For the Census of 1861, unlike that of 1851, other maps are possible. The county totals (as distinct from the totals for the 623 registration districts) are given in terms of the civil counties, *e.g.* 3837 people born in *civil* Cambridgeshire are recorded as living in *civil* Huntingdonshire. There is therefore no question of overlap along the county boundaries, and it is possible to construct a county map showing emigration from civil Cambridgeshire; this has not been done here however in view of the more detailed nature of Fig. 2. It is also possible to construct a county map of movement *into* civil Cambridgeshire. This shows, though only in a general fashion, that migration into Cambridgeshire, like that out of it, was mainly a short-distance movement (Fig. 3). The net result of these outward and inward movements is seen in Fig. 4 which represents the balance between imports and exports up to 1861. The main areas gaining at the expense of Cambridgeshire were the counties to the south (especially London) together with Warwickshire, Nottinghamshire, Derbyshire, Lancashire, and Durham. The figures for 1861 distinguish between the sexes. It is interesting to note that more women than men had

[1] In 1851 the University was in residence on Census night, while the 1861 Census came during a vacation. The resident population of the University between 1851–61 was about 1500. This figure did not affect the movement *from* the county, and affected the movement *into* the county only to a very slight degree, as the 1500 or so came from different localities.

Fig. 4. Movement to and from the civil county of Cambridge

Fig. 3. Immigrants into civil county of Cambridge, 1861

left the county; for every six men there were seven women emigrants. Generally speaking, they both went to the same areas.

An idea of the numbers of people involved in 1861 can be obtained from the following table:

	1861 *Civil County*
Born in Cambridgeshire	
living in England and Wales	193,044
but not in Cambridgeshire	51,446
Born and living in Cambridgeshire ..	141,598
Living in Cambridgeshire but born elsewhere	
in England and Wales	33,091
in Scotland	254
in Ireland	598
in islands in British Seas	34
outside the British Isles	441
Total population of Cambridgeshire ..	176,016

An attempt to illustrate the mechanism of the movement between Cambridgeshire and north-western England is made on Fig. 5. As this shows

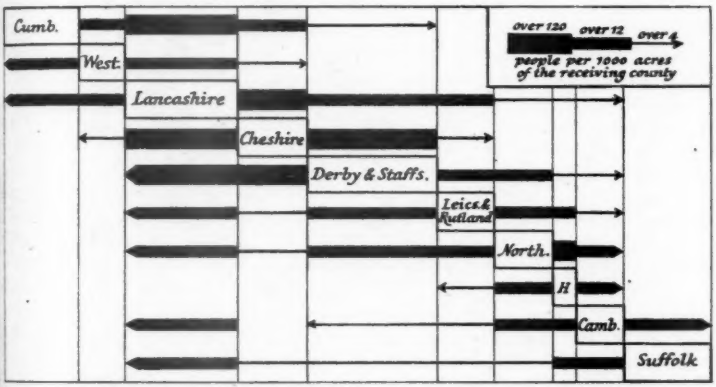


Fig. 5. Movement of population along a belt of counties from Suffolk to Cumberland up to 1861

only one sequence of adjacent counties, it cannot represent all the facts. The main export from Leicestershire, for example, had been to Nottinghamshire and Warwickshire. But despite its deficiencies the diagram is indicative enough; many more could be made for other belts of counties. The facts can be expressed in a different way; thus, out of every ten thousand people that had been born in Cambridgeshire, 7334 were still living in the county in 1861, but 199 had moved to Huntingdonshire, 84 to Northamptonshire, 17 to Leicestershire, 4 to Rutland, 18 to Staffordshire, 19 to Derbyshire, 87 to Lancashire, 2 to Westmorland, and 1 to Cumberland. Other sequences

of adjacent counties taken in different directions would give similar results. The attraction of London was especially marked, the corresponding figure for Middlesex being 737.

But into this distribution of 1861 the effects of many previous decades enter, and it is hardly an adequate measure of the changes of the preceding decade. Fig. 6 shows these changes more clearly by indicating the increase or

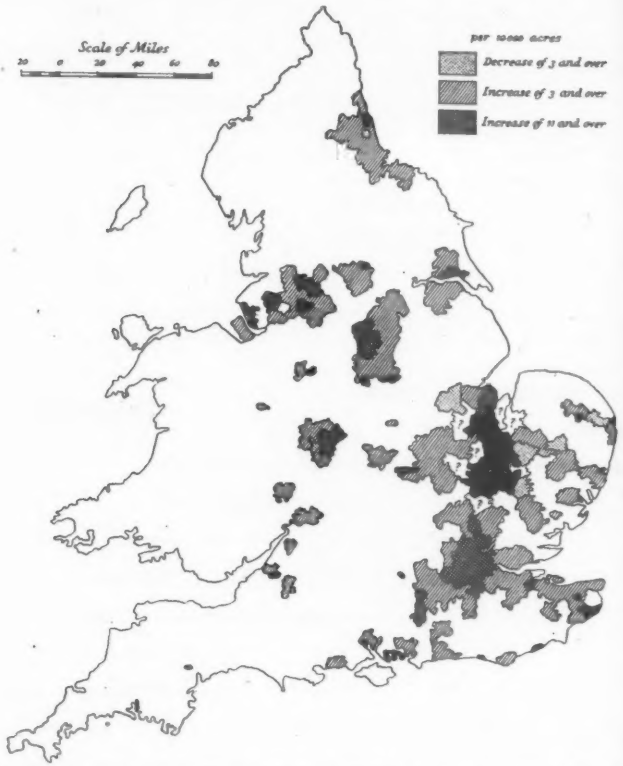


Fig. 6. Movement of population to and from the civil county of Cambridge, 1851–61

decrease of Cambridgeshire natives per 10,000 acres of the 623 districts of England and Wales between 1851 and 1861. Small differences have been ignored in the shading so as to indicate the main features. These main features are: a surprising decrease in a few districts near to the county, here the Cambridgeshire-born must have died or gone to live elsewhere; a concentration of immigrants in London and the area around, and in the industrial centres of the midlands and the north.

For Cambridgeshire during these ten years, at any rate, the call of the

London area and of the industrial districts was a force as strong as the earlier movement over short distances. This may have been due to the contemporary economic situation and to increasing railway facilities, although it seems according to Ravenstein that, generally speaking, railway communication did not change the main features of short-distance migration. All we can say is that in this particular example the short-distance theory to a great extent breaks down. This does not necessarily invalidate the general theory; before 1851, short-distance movement was predominant; after 1851 it may still have been a characteristic feature for many counties. But the final word on these matters awaits a comprehensive analysis of the Census Returns.

CLIMATE AND CIVILIZATION

CLIMATE AND THE ENERGY OF NATIONS. By S. F. MARKHAM. *Oxford University Press*, 1942. 9×5½ *inches; 144 pages; sketch-maps.* 10*s* 6*d*

ANY work which sets out to "trace the scientific causes of the rise and fall of civilization" is sure to be stimulating; and when, as in this case, the writer ventures to isolate "the most effective cause," it is bound to be controversial as well. Briefly Mr. Markham's thesis is this: man's energy depends basically on the climate in which he lives; energy is a prime essential of any civilization, and civilization has its best chance of developing where the climate indoors and out-of-doors is most suitable for man's activity. By "most suitable," the author means a climate where "there is a daily temperature average of between 60° and 76° F., with a moderate humidity, a gentle breeze and agreeable sunshine": in conditions such as these "the human being is at his healthiest, disease at its lowest, energy at its highest, and the nation that enjoys these conditions, with ideal indoor conditions, will have an immense advantage over its rivals." Mr. Markham is so confident about the civilizing influence of such a climate that he believes "the thirst for mortal power" would give place to "the thirst for mental poise, and to the lust for light," if all men could but enjoy it.

To support his case, the author analyses the effects of various heating and heat-conserving contrivances, such as clothes, buildings, and fuel, on human progress, surveys the rise and decline of the historic communities from the Sumerians onwards, considers how modern nations stand in the matter of climate, and forecasts the probable consequences of climate control (through such agencies as air-conditioning) on human energy and national efficiency. While his facts are not all equally significant, their cumulative weight is impressive. He shows, for instance, that the countries whose climate approximates most closely to his ideal limits, *e.g.* New Zealand, have the lowest infantile mortality and death rates, and the highest per capita income and share of the world's trade. He also claims that the converse proposition is proved by the experience of those Jews and Gentiles who have wandered away from the ideal zones.

Needless to say, it is not difficult to find flaws in a thesis so uncompromisingly deterministic. In the first place, Mr. Markham ignores the fact that the human body possesses "thermostatic" equipment which makes it possible for man to adapt himself to widely differing climatic and weather conditions, and

to acclimatize himself without impairing the health of mind or body. The Chinese, in particular, do not appear to be adversely affected by any tropical or temperate climate. In the second place, he does not recognize the fact that individuals differ in their response to given atmospheric stimuli. So divergent are these responses that in the matter of air-conditioning, for instance, American engineers have found it impracticable to design installations that will make more than 50–65 per cent. of an average group of workers, shoppers, cinema-goers, etc., comfortable at any given season. Furthermore they have found that the average, as well as the individual's, comfort zone shifts markedly with the season, with living habits, and race. Facts such as these render futile attempts to make any but the crudest predictions of the relative or absolute idealness of a climate. All we can say is that when the temperature and humidity together exceed, or fall below, certain levels, almost all persons at rest will rate the conditions as uncomfortably hot, or uncomfortably cool. The upper level, as shown by various experiments, occurs about a wet bulb temperature of 85° F. (corresponding with such very different dry bulb and relative humidity combinations as 95° F. and 70 per cent., and 110° F. and 30 per cent.). The lower level is located round about 55° F. dry bulb. Between these extremes a wide variety of comfortable and uncomfortable conditions are found according to individual circumstances.

Another point to which Mr. Markham does not attach sufficient importance is that monotony of climate can be far more inimical to the maintenance of good health than its warmth or humidity. Where the factor of variability, in the sense of day-to-day changes, is small, even though the mean temperature approximates to the ideal, the body tends to lose its ability to accommodate itself to any unusually large change without pathological consequences and loss of energy.

Devotion to his thesis is also responsible for some errors of fact. Thus, in order to make the point that all the early civilizations stood in close geographical relation to the mean annual isotherm of 70° F., the author states that Cusco, the presumed home of the Incas, is "not far" from the isotherm in question. While this may be roughly true geographically speaking, from a strictly thermal standpoint it is nearer the 55° F. isotherm. A similar claim is made for early Chinese civilization, yet the basin of the Yellow River, where it originated, is 1000 miles north of the 70° F. annual isotherm. It is presumably on the same "not far" principle that the 70° F. isotherm (see map on p. 40) is made to pass through places with mean annual temperatures ranging from 58° F. (vicinity of Quetta) to 73° F. (Nineveh), and this in a thesis which draws nine-tenths of its arguments from climatic statistics. Again, in discussing what happens to the white man who settles down in the tropics, Mr. Markham declares that the second and following generations show "a gradual deterioration, a social and economic retrogression, until . . . the white man becomes, not only lazy, but also considerably lower than a decent native." Generalizations of this sort are as unwarranted as they are unjust; thousands of Dutch colonists in Java, and Spanish in Peru, not to mention Germans in Brazil, and Anglo-Saxons in Queensland, have already given the lie to them. Even where deterioration is in evidence, it is by no means certain that climate is the cause. Much of the trouble is hygienic, and it is too early to conclude that a practical tropical hygiene such as will insure men against progressive debilitation cannot be devised. It is common knowledge, moreover, that over-indulgence in alcohol accounts for many of the "casualties." As Robert G. Stone has recently reminded us: "The attention to the bar in warm countries springs fundamentally from a need for stimulation which the climate fails to give. A daily set of

tennis or some other vigorous exercise in place of the extra high-balls would be the best solution."

Some idea of the lengths to which the author has carried his climatic determinism can be gleaned from the fact that he believes it ought to be possible to derive "a mathematical equation (which would) express the degree of prosperity a given group of people attain when placed in certain conditions of temperature and humidity." Among the evidences offered in support of this belief we find the following statement: "The flat humid districts of the East End [of London] have long been noted for their poverty, and the higher and drier districts of the northwest for their prosperity." Even if this were a statement of fact, it is hard to see wherein it forwards his main argument, for in the preceding paragraphs he had observed that the highest mortality rates and unemployment figures are found in the most humid parts of England and Wales, namely, in the hillier north and west, and that the lowest rates are found in the least humid parts, the flatter southern and eastern counties. This being so, it is difficult to understand why the flat East End should be more humid (and so poorer) than the higher north-west. Actually, of course, it is not more humid (*i.e.* more rainy, for this is the sense in which Mr. Markham uses the word when analysing the mortality and unemployment rates), for Hampstead is appreciably rainier than Poplar or Woolwich.[1] But even if the statement were correct, Mr. Markham would still have to explain the prosperity of many flat Thames-side suburbs to the west of London. In view of the commonly recognized differences in the "feel" of the air, and its therapeutic qualities, at places so near together as to be almost indistinguishable climatically, it may well be the case that our meteorological instruments are not as sensitive as our bodies to significant atmospheric change. Be this as it may, it is clearly fallacious to lay over-much stress on climatic means which, for all their uses, seldom if ever represent the actual combination of meteorological conditions in which men have to live and work.

G. H. T. KIMBLE.

REVIEWS

ASIA

PEACOCK ANGEL: being some account of the votaries of the Yazidi tribe and their sanctuaries. By E. S. DROWER. *London: John Murray*, 1941. $8\frac{1}{4} \times 5\frac{1}{2}$ *inches; x+214 pages; illustrations.* 10*s* 6*d*

People who indulge in a secret cult must expect to be maligned and misunderstood. Their neighbours have given to the Yazidis, who inhabit the lovely hills and valleys north of Mosul, the opprobrious and it would seem wholly misleading title of Devil Worshippers. Their Peacock Angel, chief of the Seven Angels who rule the world, is, as Lady Drower bears witness, "a Spirit of Light rather than Darkness." The misconception of their faith is perhaps due to the tabu they observe against uttering the name of Satan. The people themselves are almost wholly illiterate and their theology is naturally nebulous, but in practice their religion seems to be a lofty and satisfying pantheism which sees God in sun and planets, in the living green of trees, and in the purity of the mountain spring.

[1] In 1938, which was almost an average year in the matter of rainfall, Hampstead Observatory reported 22.31″, Poplar (Isle of Dogs) reported 17.91″, and Barking 16.91″.

Lady Drower had only a few weeks to spare when in 1940 she went into their hills to study the Spring Festival of the Yazidis at the shrine of Melke Miran, in order to compare its rites with those of Spring Festivals elsewhere in 'Iraq. She modestly claims that her book is "merely a personal impression of day-to-day happenings and friendships" among a lovable and simple people remarkable for their hospitality and cleanliness and for their relative freedom from superstition or fanaticism.

"Without a knowledge of Kurdish it would be impossible to gain the confidence of the religious chiefs or to understand the chants of the *qauwals*," she writes; but from Arabic-speaking Yazidis she gleaned enough to throw interesting sidelights on the Yazidi religion as it works out in daily life and enough, she hopes, to stimulate "some honest and skilled investigator" to make a thorough and scientific study of this interesting people before westernized education has ironed out the characteristic features of their remarkable culture. Slight though this book may be compared with the author's valuable and detailed study of the Mandaeans, it offers delightful refreshment to the general reader and makes no negligible contribution to anthropological knowledge. E. O. L.

NORTH AMERICA

PORTS OF PISCATAQUA . . . maritime history of the Portsmouth, N.H., Customs District . . . to the time of Abraham Lincoln. By WILLIAM S. SALTONSTALL. *Cambridge, Mass.: Harvard Univ. Press*, 1941. (*Oxford Univ. Press.*) 11×8 *inches;* xii+244 *pages; illustrations and sketch-maps.* $3.50 (20s)

The story of the life and trade of the New Hampshire ports along the Piscataqua from 1623 until the last of the clippers was built is full of interest and detail. Most of the port have English names such as Portsmouth, formerly Strawberry Banke, South Berwick, Dover, Durham, and Newcastle, for the district was first colonized by Puritans from England. These found that the barren soil made life hard and naturally turned towards the sea. The early trade was mainly with the West Indies; later, shipbuilding, general carrying, and fishing became important. But it was the mast trade for which the region was most famous. The British Navy Yards sent inspectors to brand the trees selected for the Navy with broad arrows, a practice much resented by the independent New Englishmen who insisted on selling where they could get the best prices. It has even been stated that "one reason England lost the Revolution was that the great masts of New Hampshire and Maine, on which they had depended since Cromwell's day, were no longer available." The English "had not developed the art of constructing 'made masts' and Riga fir was no substitute for New Hampshire pine."

In the early days of the shipbuilding, cordage, iron, and duck for sails had to come from England, but soon we read of rope-makers, of bog-iron works, and hemp growing, though it was some time before these were very successful. Even in 1724 "the Thames River builders made public protest that their trade was being destroyed by the departure of their best workmen for America." And the British Government showed its faith in the workmen at Portsmouth, N.H., by giving them orders for two naval vessels in 1690.

The stories of privateering, at first during early wars between the British and French, later during the Revolution and the War of 1812 against the British, make good reading. This form of warfare was so successful and so profitable to the district that special privateering ships were built, and the Treaty of Ghent provided "a graduated series of time allowances for different parts of

the seas within which any captures made in ignorance of the peace should be fair prize."

The book is interestingly written and the author knows the region intimately, having explored everywhere in small ships. Readers with some personal connection with the district will enjoy this book, though for those without there is rather too much detail and too many accounts of small incidents. D. R. C.

CENTRAL AND SOUTH AMERICA

YUCATAN. By LAWRENCE DANE. *London: Victor Gollancz*, 1942. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 188 *pages; illustrations and sketch-maps.* 12*s* 6*d*

The title of the book leads one to expect a formal treatise on the Territory of Yucatan, but this role is far from being realized. There is a good deal of historical and anthropological matter in the volume together with some geographical material, but it is so erratically dispersed that irritation is often induced. The explicit intention of writing a book stalks through the pages like a ghost and the reader's perpetual encounters with it are disconcerting.

The limestone carapace above a low water-table is the most striking feature of northern Yucatan. Hence the innumerable windmills in Merida, the capital, with its pretentious buildings mainly built from a boom in henequen. Henequen is characteristic of the neighbourhood and the author recounts how forest replaces this spiky vegetation farther south. The general flatness of the land is relieved by low hills near Labna south of Merida. The people are fully described and ample space is allotted to their rather intimate habits as well as to their folklore of deities and bogles. Their history since the invasion by Montejo in 1527 and their defeat in 1549 is chiefly notable for the fierce revolt of 1847 when they inflicted heavy casualties on the Spanish and Mexican population living in the settlements and haciendas amongst them. Since then there has been little more than a make-believe dependance upon the government of Mexico City in the remoter spots. Yucatan is known to most people as a land of Maya ruins, and while a few of these were visited by the author there is no very connected description of them, which is not surprising in view of the scholarly research work carried out by the anthropologists of the Carnegie Institution.

The author and a friend made a few journeys on foot from Chichen Itza, the headquarters of these scientists, their kit being transported by donkey. Ticks, mosquitoes, and tarantulas made their impression on the traveller, and he saw the evidence of plenty of snakes. He acquired a surprising respect for the timid iguanas whose delectable flesh it seems he did not appreciate, and mentions "English tea tablets" as delicacies which it is hard to understand on this side of the Atlantic. There are twenty-nine illustrations and a diagrammatic map without a scale. There is no index. As light reading or as a popular introduction to Mayan anthropology the book is to be recommended. J. V. H.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

GEOMORPHOLOGY: systematic and regional. By O. D. VON ENGELN. *New York: Macmillan*, 1942. $9\frac{1}{2} \times 6$ *inches;* xxii+656 *pages; illustrations and diagrams.* $4.50

It is said that a shoemaker should stick to his last, but Hans Sachs demonstrated that instructive results may develop if he sometimes keeps it rather in the background. Professor von Engeln has produced a most excellent volume by taking a more generous view of the world than geomorphologists usually allow themselves, and seems to maintain a better balance between realism and idealism of

landforms than is usual in books on geomorphology. His work is also welcome for the review it provides of the school of thought which has arisen in Germany centring around the writings of Walther Penck, and for recalling that the followers of W. M. Davis do not enjoy a monopoly of ideas regarding the earth's sculpture. There are profuse illustrations including many newly drawn diagrams of which about half are unusually attractive, and some excellent photographs taken from the air or by sundry artists not the least of whom is W. Rickmer Rickmers.

In the opening chapter in this "discourse upon the form of the earth" the author provides a brief historical summary of how awareness to the problems has developed, helped on since Werner's time by Playfair, Lyell, and Gilbert to the stage when Davis presented his synthesis and W. Penck challenged its foundations. It is followed by a useful review of many well-known treatises on the subject. It is interesting to realize that Davis' own formal contribution appeared in German as a result of a course of lectures he delivered at Berlin University and that it was left to Cotton to provide a similar volume in English. The second chapter contains an appreciation of the relative importance of things as they are; that continents and oceans are the features to be decorated; and that the main items in the scheme of decoration are big things like plains, plateaux, and mountain ranges. What usually passes for Geomorphology is often concerned with little more than the details superimposed on these major features of the surface of the earth's crust. There are many theories propounded to explain the relationships between the big units and these are briefly outlined in the light of very recent literature. Then comes a chapter tending to dispel the illusion that the topography of sea floors is a succession of dreary and monotonous almost imperceptible smooth curves. Where the detailed surveys of a few chosen areas have been completed they present a map almost as varied as so much land surface. A diagram of the ruggedness hidden under Alaskan waters, for instance, is evidently representing one of the ocean's wilder spots. Naturally the enigmatic submarine canyons are mentioned here and the suggestion that the shore line receded 10,000 feet or more in rather recent times is aired and reluctantly labelled as being "rather unthinkable."

In many compartments of earth-lore classifications are unwieldy artificialities. As a useful means of cataloguing landforms the author's attempt may find a high place. It is based on the concept that ornament bears a fairly close relationship to the structure of the underlying upper layers of the crust. Hence he provides the comprehensive division into land upon simple or upon disordered structures. The first embraces unfolded features like sediment or lava-covered plains which are flat or nearly so in their original condition, and volcanoes and coral islands which are not. The second is concerned with a folded and faulted terrain, whether made up of relatively young and easily weathered sedimentary rocks or of tough venerable metamorphics like the schists and gneisses of the Canadian shield, Siberia, or Antarctica. Besides a table of classification there is a coloured map of South America to illustrate by reference to regions what the scheme implies. Evolution is the watchword of the disciples of Davis, as from whatever varied start they see the surface approaching the unattainable peneplain. Those who follow Penck seek to reconstruct the past topographies and so assess how earth movements took place.

Chapter 13, like the first four which have just been discussed, is quite unusual in a book of this title and deals at greater length with the German school's point of view. As there has been a decline in the number of German-reading students in this country it is fortunate that this discussion should appear in English. There are concepts in it almost as hard to grip as those, for instance, in Parsifal,

which are almost insuperable when wrapped up in an imperfectly or incompletely understood foreign language. Even the comparative diagrams (Figs. 137 and 138) make it hard enough to get an idea so different from that in which most people in this country have been conditioned. Slope is enthroned. It is convex during uplift, straight during an intermediate period of rest before reverting to the concave forms of old age. The start from the ideal which is just as unachievable as the peneplain at the end of things, the *primarrumpf* is something which takes a lot of getting used to. In this system the normal state of affairs is taken to be long continuity of uplift instead of jerky movements with resting between them, but even so the discontinuity of slopes develops whether in the bed of streams or upon the shoulders between them.

There are eighteen other chapters in all in which the more usual features of the subject are considered with one of these devoted to the study of a special and well-investigated region, the Appalachians. In these the definitions and life history of the many features which rejoice in special names are duly set forth, and not only the selection usually encountered but a batch of less common ones with a German background as well. The author occasionally uses uncommonly ugly words like kar-niveau and dubs corrie, cwm, and others "foreign terms occasionally used in English when the reference is to the occurrence glacier cirques." His dictum that descriptive conciseness depends upon the abundant use of jargon (p. 81) is perhaps true, but not a pleasant truth. Still such jolts, when the reader recovers from the first impact, completely prise him off any mental isolation or complacence, and stimulate the critical faculties.

The letterpress in this book is by no means the whole story, and for the pictures alone would be worth most of its price. Pictorially Bryce Canyon, Disenchantment Bay, the Lauterbrunnen Valley, and Daytona Beach take high places, whilst some of the diagrams are very welcome, such as the Lockport escarpment and Niagara, the group of five block diagrams illustrating the fluvial cycle in folded country, and Pikes Peak. Air photographs are freely and effectively used to augment those taken from ground level, Rainbow Natural Bridge and Ship Rock being two that are specially informative.

There are quite a number of misprints. In spite of minor defects this book, though it is by no means written in happy English, should be on the shelves of all who have any interest in landforms, their growth, decay, description, and the literature built up around them. References to literature published as late as 1941 are given and there is a satisfactory index. J. V. H.

ECONOMIC AND HISTORICAL GEOGRAPHY

FOUNDED UPON THE SEAS: a narrative of some English maritime and overseas enterprises, 1550–1616. By W. OAKESHOTT. *Cambridge: Univ. Press*, 1942. 9×5½ *inches;* xii+200 *pages; illustrations.* 12*s* 6*d*

Mr. Oakeshott provides a straightforward account of some of the outstanding episodes of English naval and overseas history, from Chancellor's attempt to make the north-east passage to the successful settlement of Virginia. Disclaiming any pretentions to original scholarship he relies as far as possible upon eye-witnesses' accounts, but uses the results of modern research where the record is defective. The narratives are carefully related to the general contemporary background, compounded from domestic and international politics, geographical theory, and developing naval tactics and equipment. These are not allowed to obscure the human interest, and the unity of the book depends largely upon the contrasting temperaments of three outstanding personalities:

Hawkins, the administrator with a gift for intrigue; Drake, the tactician and man of action, capable of inspiring others with something of his own spirit; and Raleigh, soldier and scholar, pursuing the vision of overseas empire. Perhaps to these should be added a fourth, the Queen. In dealing with the Armada, the author brings out the change in naval tactics, exemplified in the contrast between the individual brilliance and dash of the English commanders and the discipline and orderliness of the Spaniards, which, despite the loss of the weather gauge in the opening phases, almost carried them to success. Their defeat lay in failure to decide upon a well-defined objective. At the time of writing the author was, inevitably, influenced by contemporary events, but he has wisely refrained from pushing too far the superficial resemblances between the events of to-day and those of the sixteenth century; the lessons to be drawn from the earlier struggle are implicit throughout his book. To the course of modern events may perhaps also be ascribed the sobriety of the author's outlook and style. There is none of the once fashionable swashbucklers about his heroes, for he is content to set down plainly the manner of men they were, the work they undertook, and the success or failure which attended them.

Throughout he makes much use of sixteenth-century cartography to clarify obscure points in the narratives, and has illustrated his work with several reproductions of maps, charts, and draughts of ships. One of these, hitherto unpublished, is a sketch of Nombre de Dios, made at the time of Drake's attack. The statements on cartographical history made in the opening chapter are not always accurate.

G. R. C.

GENERAL

THE MYTH OF OPEN SPACES; Australian, British, and world trends of population and migration. By W. D. FORSYTH. *Melbourne: Univ. Press*, 1942. (*Oxford: Univ. Press.*) $8\frac{3}{4} \times 5\frac{1}{2}$ *inches;* xviii + 226 *pages; sketch-maps and diagrams.* 17*s* 6*d*

In this concise study, based upon personal investigation and extensive research, the author summarizes much recent work on the relations of population growth and migration, with special reference to Britain and Australia. The careful arrangement of the material and the clear style allow his wide ranging and compressed arguments to be easily followed. His book should be especially useful here, as much of the Australian literature cited is not readily accessible.

The study is divided into two parts: the first deals with the course of migration in the past and the influences which have affected it. By 1930, the British Isles and north-western Europe had ceased to be the main sources of overseas migrants. Apart from the decline in population growth, which has already received much attention, the author stresses the fact that internal migration within Europe has become much more significant than the external movement. This is attributable to the growth of the great industrial concentrations, and the development of secondary and tertiary, that is, accessory and luxury, manufactures. He considers that this concentration will continue, for it is essential to rising standards of living. With regard to the receiving areas, economic trends have limited their power of absorbing immigrants. In Australia particularly, agriculture, formerly the primary employer of immigrant labour, no longer plays this role, partly because technical advance secures the same or greater output from a smaller labour force, partly owing to the difficulty of finding world markets for the exports upon which her economic structure mainly rests. This difficulty is again linked with the decline in population growth, resulting in a relative slowing-up of demand. Thus although it would be possible to open up some new areas for agricultural settlement in Australia,

and initiate closer settlement in others, recent economic conditions would not justify this step; he considers moreover that such areas would meet only the internal demand among Australian farmers. There remains the possibility of industrial expansion, but here again he does not look for spectacular advance. There are deficiencies in certain minerals, and Australia is not well placed in relation to world markets. If however it should be found after careful investigation that the rate of population growth was falling behind capital accumulation, a careful policy of long term and large scale public works might be undertaken, which would provide opportunity for the infiltration of a limited number of immigrants with technical qualifications. Past experience has shown that it is rising economic activity in the receiving country that stimulates immigration, and the author emphasizes constantly that Australia's problem is "not open spaces but open doors," that is, to world markets.

The second half of the book is concerned with future prospects. The conclusion reached is that Australia cannot look to Britain or north-west Europe for large numbers of immigrants. If post-war conditions result in a lowering of the standard of living and thus tend to encourage migration, these same conditions would deprive Australia of the ability to absorb large numbers. On the other hand, without this deterioration, there will probably be many in south-eastern and eastern Europe who would wish to emigrate. If it is desired to increase markedly the population of Australia, she must be prepared to accept immigrants from these countries in place of the traditional stock, and apart from the economic considerations already noted, the assimilation of diverse cultural groups should be investigated. The substantial increase of Australia's population, whatever may be achieved by such policies, ultimately depends upon raising the rate of natural increase within the country.

It will be seen that the economic argument is not necessarily opposed to the entry of large numbers of settlers prepared to support themselves on a subsistence basis. Such an inflow however would ultimately undermine the present Australian standard of living, and perhaps also the White Australia policy. The author recognizes frankly that arguments on this basis alone are not likely to secure universal assent, and that if they are to be maintained Australia should be prepared to contribute positively to a more stable economic system, particularly in the East, through international schemes for investment and development in Asia, and freer trade.

G. R. C.

THE EARTH AND MAN: a human geography. By DARRELL HAUG DAVIS. *New York: Macmillan*, 1942. 10×7½ *inches;* xxiv+676 *pages; illustrations, sketch-maps, and diagrams.* $4.25

This book is meant for young, alert, and intelligent people, at a critical stage in their education, for it is written for beginning geography classes in American colleges and universities. Such a work would be important at any time, but is specially so at this period of the world's history. Given a favourable outcome to this great struggle we shall shortly be concerned with an attempt to make a brave new world. In that task young people now of university age must play a leading part. It matters greatly that they should have knowledge of conditions in lands other than their own, and should understand the factors which have brought about those conditions. It is nowhere more vital than in America that young people should get the right equipment in knowledge and in outlook. This book ought therefore to be carefully considered.

In his preface the author describes the book as "A text-book . . . not a compendium of geographical knowledge but a predetermined selection of material from the entire field of the subject to secure designated results."

Dealing very briefly in Part 1 with the growth of knowledge and the field of inquiry, the author goes on in Part 2 to discuss the general problem of Man and Environment. He treats of the function of environment and of the factors operating to change it. He states here a philosophy of geography, acceptable to geographers, but one which, at this stage, students will have neither the knowledge nor the experience to understand or to apply, for they cannot yet judge the truth of the principles upon which it is based. The statement is necessary to the development of the book, but it would be better placed at the end rather than near the beginning.

Part 3 is concerned with the limiting effects of environmental factors on man's activities. These factors are classed as: climatic—sunshine, temperature, moisture, winds; soils; inland waterways—navigation, power, irrigation, water supply; surface features; minerals; oceans and their coasts; plant and animal life; space relationships. Thus he treats physical geography not as an end in itself, but as helping to frame and to explain the environment in which man can work out his destiny. The chapter on winds may present difficulties to beginners. The subject is difficult and complex, requiring a good background of physics for its proper understanding. There are also gaps in our knowledge of the facts and their causes, and perhaps no clear and logical explanation of the distribution of winds and their variation will be possible until these gaps are filled. Much progress has been made in meteorology during the war but the new knowledge cannot yet be made available. In the light of these advances the chapter may have to be modified for a future edition.

Part 4, How Man Obtains His Living, is an introduction to regional work, the study of environmental factors as they operate, singly or in selected combinations, to limit or to encourage man in his relations with his physical surroundings. It deals with man the agriculturalist; the forester; the fisher and the hunter; man and transport; man in industry and in commerce; man in the cities and the towns. Many of the examples used to illustrate this section describe the more backward, less complex societies. Thus he treats of the Eskimos and the Kalahari bushmen, among others, as primitive hunters and fishers; the Fang of French Equatorial Africa and the Djuka negroes of Dutch Guiana as primitive agriculturalists. Such examples are well chosen, having regard to the author's thesis, for they show different types of relationships between man and his environment, and also that, in this twentieth century quite primitive reactions to environment can exist contemporaneously with the most complex industrial organizations. But it is shown quite clearly that because of the limitations of their environment these communities can hope to make but little further progress, a good point to make with young geographers.

Apart from these and others like them, examples illustrating Parts 3 and 4 relate to the United States, though reference is occasionally made to types which cannot be found in the home country. Thus the examination of Inland Waterways and Navigation is confined almost exclusively to the United States. Europe is mentioned but the references are not developed in any way; so also with irrigation. The many schemes planned or completed in the U.S.A., such as, for example, the T.V.A., the Boulder Dam, the Columbia and Colorado river basins, and the Central and North California projects, are fully treated in both text and illustration. Nothing is said however of the great river control and irrigation work in the Nile basin, nor of similar great works in India. These have radically changed the human geography of the countries concerned and have profoundly modified the physical environment of their peoples. They are therefore of first-class geographical importance. Examples of occidental farming relate entirely to the United States, except for the most cursory of

references to U.S.S.R. "collectives" and Canadian fruit farming. Forests are necessarily treated in a more balanced way, yet but scant justice is done to the vast forest areas of Eurasia, particularly in the U.S.S.R., Norway, and Sweden, and nothing whatever is said of the influence which throughout history they have had on man's movements and development. A short study of Sweden or Finland would have pointed this moral very well.

These are criticisms of more than details. The book, as it stands, may leave the impression that all human geography worthy of study must be centred in the United States; that there alone exist complex societies capable of the utmost development of their favourable natural inheritance. The highly developed civilizations of Western and Mediterranean Europe, or the progress of modern Russia, play no part in the picture here presented. The manner in which white men have adjusted themselves to many types of environment in every continent are barely suggested and never seriously considered. The author's claim to have drawn his material from the whole field of the subject is not borne out by the text. Such omissions affect seriously the value of the book, for they may tend to encourage in the student readers a species of intellectual isolationism.

Nevertheless the conception of the field of study of Geography, given by the book as a whole, is wide and scholarly. Emphasis on the interdependence of peoples and the consequent necessity for cooperation; insistence that nature's great endowments, such as forests and minerals, are the property, not of the people within whose borders they are found, nor of those who exploit them, not even of any one generation, but of the whole world, to be used therefore always prudently and economically in the common interest: these are good points to make now. The author returns again and again to the subject of soil erosion, especially that resulting from improvident and pioneering agricultural practices in the United States. Some of the photographs are startling in their revelation of the devastation caused. He insists also that because of this destruction, affecting far more than the neighbourhood and the period immediately concerned, there must be conscious and authoritative planning in land utilization, a doctrine so well preached by Dr. Dudley Stamp and the Scott Committee. Nor can man plan once and for all but must for ever be revising his outlook, for environment is not static.

The book is profusely illustrated by photographs, maps, and diagrams. The photographs are well chosen and the letter-press explaining them helpful in indicating the essential points of the picture. There is a good reading list, too, though few books not published in America are mentioned. The maps showing world distributions are not good. They are on too small a scale, and the projection used, a "broken" Sanson-Flamsteed, is unsuitable. The style is a little heavy at times, and the somewhat monotonously long sentences occasionally lack clarity. There will not be general agreement with the idea of a text-book for students at the University Stage of education, but if this must be the method employed, a successful effort has been made to treat geography seriously and sympathetically. The book should made a strong appeal to both the intellect and the imagination of those who study it carefully. W. F. M.

A ROUGH RECORD. By ADMIRAL SIR WILLIAM GOODENOUGH. *London: Hutchinson*, 1943. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 164 pages; illustrations. 12s 6d*

The author of this book was a cadet at Dartmouth in 1880 and Commander-in-Chief at the Nore in 1926. During almost the whole of that period of forty-six years he was an active officer in the service that he loved and to which he was bred from birth. At the start of his career steam was ousting sail, and at the end of it oil and electricity were superseding steam, while the range of guns in-

creased from the 1200 yards, which the author notes as the extreme range of the ships on the West Indies Station when he was there in the 'eighties, to the 16,000 yards of the Battle of Jutland. The story of such a life could not fail to be interesting, but this book is much more than the "rough record" which the author modestly calls it. Certainly he makes no attempt to paint masterpieces, but his sketches of character and events are vivid. The picture of his parents, which he draws in the first pages of the book, was well worth setting down for present-day readers. It is easy, and to-day somewhat the fashion, to deride the Victorians, but they had great qualities. There may be a modicum of truth in the charge of prayers-before-breakfast and snobbish hypocrisy and money-grubbing for the rest of the day. But people such as Captain and Mrs. Good-enough, whose lives were based on duty and Christian charity, are also typical of their epoch and such as they justify our pride of race. Admiral Good-enough's account of his own career is instinct with this inherited sense of duty and its corollary, training for command.

Great naval figures are recalled in these pages and in a few lines the author brings them unforgettably before us. From Sir Leopold McClintock to Sir Andrew Cunningham the book is a gallery of portraits, some historical, others more or less forgotten, but all etched in with a pen steeped in the kindliest of acids. Lord Fisher, Lord Jellicoe, and Lord Beatty are put before us as seen by a sympathetic but keenly professional eye, and Admiral Goodenough's study of Lord Fisher would alone make the book worth reading. Of his own career the author scarcely speaks, save to record his various stages from cadet to full Admiral, but his very reticence makes it easier to discern the possession in a high degree of the best qualities of a naval commander. And one of those qualities was clearly the valuable gift of getting on well with people ashore. Admiral Goodenough understood that the British naval officer in foreign ports and countries carries a responsibility even beyond that of looking after his ship or his squadron or his fleet: he represents, to the people with whom he comes into contact, the British race, and the impression he makes may colour for good or ill those people's opinion of his country. It is clear that in this sense Admiral Goodenough can take rank amongst the best of our ambassadors.

To readers of this *Journal* the pages devoted to the Royal Geographical Society will be of especial interest. They are well worth reading for they lay down, out of long and wide experience, the principles which should guide this Society and the travellers and explorers for whom it so often stands as god-father. Every word is instinct with sympathy and understanding for the explorer and his difficulties but also insistent on the qualities which his chosen task calls upon him to display.

The whole book is full of colour, it is infused with humour, it takes us all over the world, it brings us into contact with great and interesting and historical personalities, it is a book that every young officer of all three Services would do well to read.

GEORGE R. CLERK.

THE MONTHLY RECORD

CLIMATE AND MAN

'Climate and man,' the title of the American Yearbook of Agriculture for 1941 (Washington, D.C., Govt. Printing Office, $1.75), is the sixth and latest in the series of reference volumes published by the United States' Department of Agriculture. Observing that "next to crop prices, nothing is more important to the farmer's business than the weather," the editorial committee responsible for this publication have produced a 1200-page volume which is at once a monument of industry and a mine of the most up-to-date information. Naturally most of the space is given up to detailed discussion of the relation of climate and weather to crop requirements, but the editors have construed their terms of reference widely and incorporated articles on many academic aspects of the subject—aspects which none the less reflect the growing dependence of agriculture upon the scientist.

The volume is divided into five parts. Part I deals with "Climate as a world influence." Under this heading R. J. Russell sifts the evidence concerning long-period climatic changes; Reichelderfer describes the work of the United States' Weather Bureau in gathering data about weather and climate and putting it to its many vital uses, while Blumenstock and Thornthwaite develop a simple system of classification comprising no more than eight major climatic types. Five of these are classified on the basis of "effective precipitation" (the super-humid or very moist, the humid or moist, the sub-humid or "inclined to be dry," the semi-arid or quite dry, the arid or very dry), and the remaining three on temperature (the taiga or tayga, the tundra, and the region of perpetual frost). It would not be difficult to criticize this classification, especially as it involves grouping together such diverse zones as the equatorial forests of the Amazon and the cool temperate forests of British Columbia. However for the purpose for which it is primarily intended, namely as a background to the world distribution of vegetation and soil, it probably serves as well as many more orthodox systems.

Part II tells of the role of climate in the lives of those who peopled the United States: how it shaped their agriculture and habits in each climatic region. From the human geographer's point of view the most valuable contributions are those dealing with the possibilities of extending settlement along the existing "pioneer fringes." Stefansson pleads as eloquently as ever for his beloved Arctic pastures, but is less inclined than formerly to easy optimism. He now admits that "the qualities which would have brought a flood of immigrants [to Alaska] in 1890 may draw only a baker's dozen in 1940." Broek, who deals with the same problem in more general terms, comes to much the same conclusion: science and technology will no doubt find ways of overcoming most of the physical obstacles, but "the borderlands with unfavourable climates can be won only with considerable effort and at high cost. This imposes a heavy burden on the modern pioneer, diminishing his chances of gaining a better living than he had in his home country." On the subject of health in tropical climates R. G. Stone likewise tempers optimism with caution. While allowing that "the human body's defences against heat do not seem to be well designed for more than short exposures," he maintains that by selecting men who possess "nervous and emotional stability, [show] no trace of hyperthyroidism and no abnormally high metabolism"—men moreover who are able to "tolerate regular doses of quinine and other prophylactic drugs," and are not predisposed to obesity or alcoholism—it should be possible to insure against pro-

gressive deterioration of mind and body. What he does not consider is whether the men with these qualities are likely to be the ones who will want to spend their lives in the tropics.

Part III will be of special interest to ecologists and economic geographers. Entitled "Climate and the farmer," it describes in great detail and with a profusion of illustrations, the effects of climate and weather on each of the major, and on many of the minor, crops produced by American farmers; in addition it tackles the problems, in so far as they are affected by climate, of livestock production, soil exhaustion and renewal, forestry, plant diseases, insects and animal parasites.

Part IV, "The scientific approach to climate and weather," takes up the question of floods and flood forecasting, discusses land-use practices in relation to flood control, tells how the American weather forecasts are made, and summarizes the present state of knowledge of meteorology. This last contribution, written by Professor C. G. Rossby, should be read by all those lay meteorologists who wish to keep abreast of the times, but who lack the equipment to follow the increasingly mathematical notions of their professional brethren. After developing at considerable length the "cellular" mechanism of atmospheric circulation, he goes on to describe less familiar aspects of the subject, such as isentropic analysis and the significance of fluctuations in the zonal circulation. Finally he shows how the information thus derived is applied to the five-day forecasting technique of which he is the pioneer. While it is still too soon to say whether this technique has any great advantage over those now being experimented with in this country and elsewhere, it is certain that no one who is interested in the problem of medium- and long-range forecasting can afford to ignore what Rossby and his colleagues at the Massachusetts Institute of Technology are doing.

Part V, comprising more than half the book, consists entirely of tables, maps, etc., prepared under the direction of J. B. Kincer, and is a storehouse of information about climate in all parts of the U.S.A., and indeed of the world. Some of the maps are new, *e.g.* depth of frost penetration and the average wet-bulb temperature distribution in the United States. An idea of the scale on which this section has been planned is conveyed in the fact that for Idaho alone statistics relating to no fewer than 125 reporting stations are given.

It is to be hoped that in spite of its tardy appearance in this country and its deservedly big sale in America, 'Climate and man' will not go out of print before copies of it have been secured by our leading reference libraries. G. H. T. K.

The volume summarized above contains in an article on the effects of climatic factors on growing plants by A. C. Hildreth, J. R. Magness, and T. W. Mitchell an altogether unsatisfactory reference to a generalization called "Hopkins's bio-climatic law" about which phenologists would like to know more. The law is briefly quoted as stating that for plants of the same species flowering is retarded on the average four calendar days for each degree of latitude north and south of the equator, advanced on land areas four calendar days for each 5 degrees of longitude from east to west, and retarded four calendar days for each 400-foot increase in altitude. The latitude relationship would, provided it were based on enough observations all over the world, be intelligible if stated to apply to extra-tropical latitudes only; but as applied also to the inter-tropical region wherein there are no simple seasons and no decided diminution of mean annual temperature on either side of the equator it is most perplexing. As to longitude it should be noted that this, unlike latitude and altitude, is not in itself a climatic influence, but can only operate through associated irregular continentality

factors, and it is hard to understand how there can be any progressive regular world-wide effect of the kind implied. Unfortunately Hopkins's original paper, "Bioclimatics" (U.S. Dept. of Agriculture, Miscell. Publ. 280), to which the reader is referred, is itself highly obscure on those very points, nor does it contain any statement of the law in the above terms, and a clarified restatement of the entire foundations of the generalization quoted is much needed. No doubt it should be possible to work out rough rules for limited ranges of latitude, altitude, and longitude so as to be able to say approximately in a particular region how much later plants respond to spring as we travel polewards or higher. But phenology, as British investigators know only too well, is an extremely complicated subject, involving not only the many effects of the weather on the seasonal functions of plants but also those of soil and slope as well as the individuality of the plants themselves. Hence any attempt to formulate a simple law on a world-wide basis can only be suspected of going far beyond what can legitimately be deduced from the present state of knowledge and research, particularly when the actual terms of the formulated law do not accord with known climatic principles. L. C. W. B.

EARLY ETHNOLOGY OF SIBERIA

Henry Field and Eugene Prostov have been placing Russian results within our reach ever since 1936, chiefly in *Amer. Anthr.* 38–42; *Am. J. Arch.* 41–45; *Am. J. Sem. Lang.* 53–58; also in *Antiquity*, 1938–41; *Ars Islamica*, V. 2, VI. 1; *Asia*, April–June 1940, also May 1941.

This last instalment ("Results of Soviet investigation in Siberia, 1940–41," *Amer. Anthr.* 44 (1942) 388–406) summarizes four articles, No. 3 from *Sovetskaya Arkheologiya* 1937, IV, 133–46, D. N. Eding, "Idols from the Gorbunovo Peatbog," Tagil district in Urals, probably *c.* 1000 B.C., very rude, similar to things long known from Shigir lake in the same region (*cf.* Eding, "New finds in Gorbunovo Peat," in *Monuments Arch. de l'Oural et du Pays de la Kama*, 1940, pp. 41–57); the others from *Kratkie Soobshcheniya* (Short Communications) IX (1941) of Inst. for Hist. of Material Cult., Leningrad. Nos. 1 and 2 go together, reports by G. F. Debets and A. P. Okladnikov on "The population of north-west Siberia in the light of Palaeoanthropology," and "Neolithic remains as a source for the Ethnogony of Siberia and the Far East." Debets declares that the neolithic of Siberia is by no means uniform. He distinguishes the Central or Baikal area, an Amur area, two varieties in Kamchatka, the eastern Arctic and western Arctic, the Obi and Kama cultures, and finally the cultures of the steppes, and, in spite of his map, of Minusinsk. Of these the Amur culture with its curvy patterns is allied to the Chinese and to south-east Asia and the Pacific; the Baikal culture belongs to people with Mongoloid affinities and their gear is very similar to that of the Tungus, now called Evenki, probably their descendants; Shirokogorov is wrong in bringing them from the south. The Mongoloids extend along the north-west right into Europe, but farther south the bearers of the Afanasievo, Andronovo, and Tagar cultures were Europoids, like Crô-magnon men, who only gave way to Mongoloids about our era: hence mixed population in the north-west is due to infiltration from Europe, in the south-west to penetration by Mongoloids among Europoids. The sentence rendered (p. 389) "In addition to the Huns, this type [*sc.* Tungusic] extends west down to and includes Hungary" should read "Together with the Huns, [*i.e.* in iv. cent. A.D.] this type penetrates to the west as far as Hungary inclusive." The contention that the Europoids with their high culture on the Yenisey and in south-west Siberia have vanished, whereas the other neolithic cultures have left descendants, is important.

No. 4 summarizes a paper by V. N. Chernetsov, "Outline of the Ethnogenesis of the Yugry on the R. Obi," (3 pp. of illustrations in *Kr. Soob.*). Part of the region is Tayga, part Tundra. In the Tayga finds begin in late neolithic with well-made axes and well-decorated pottery, those on the coast are later. Into this culture another intruded recalling that of P'yany Bor, *i.e.* the successor to Anan'ino with its connections with the steppe. The best site is just where the river Poluy falls into the Obi. The sentence "while the use of domesticated reindeer was known, some evidence suggests that tamed deer may have been used as lures in hunting," should read "we can suppose the existence of a tamed decoy deer, but keeping reindeer for riding was not known to the people of Ust' Poluy." Chernetsov's most interesting suggestion is that the Voguls and Ostyaks got the name of Yugr from the people who brought the southern contribution to the original stock, and that these were the Iyrcae of Herodotus. But it seems to me to go too far to suggest that the Ostyaks' name for themselves Khuntu=Huns, and the Voguls' Mansi=Magyar. Of course the great interest of these peoples is that they are the poor relations of the Magyars: they seem to have got their language from the Yugrian immigrants. E. H. M.

NAMES OF PEOPLES IN THE U.S.S.R.

Professor Minns has sent us the following list of old and new names of peoples in the U.S.S.R. which he describes as a "very tentative list. Names are given in the singular when I know it, but some I have only met in the plural. Some new names are subdivisions of old ones."

Old name	*New name*
Aleut	Unangan
Cheremisa	Mari
Cherkess	Adyghe
Chukchi	Luoravetlan
Chuvash	unchanged
Gilyak	Nikhvy
Gol'd	Nanai
Kirghiz	Kazakh (formerly spelled Kazak, but this=Cossack)
Koryak	Nymylaky
Lamuty	Eveny (Behring Str.)
Lapps or Lopari	Saami
Mordva	unchanged (Erzya and Moksha)
Ostyak	Khuntu or Khanty
Permyak (with Zyryan)	Komi
Samoyedes	Nentsy, Sel'kupy, Iganasane
Solomy	Evenki (part)
Tungus	Evenki
Turks on R. Biya and Katun'	Oyrot
Turks on Upper Yenisei	Khakas
Uryankhai	Tuva, Karagaz=part of Tuva
Vogul	Man'si
Votyak	Udmurt
Yakut	Sakha
Yukagir	Odul
Zyryan (with Permyak)	Komi

THE DESTRUCTION OF SHABWA

We have received from Major R. E. Cheesman a letter from which the following is extracted: "I have read with much interest 'Six weeks in Shabwa' and

immediately looked up 'Lake Tana and the Blue Nile,' and on p. 377 found a sketchy reference of mine to Gabra Maskal, Emperor of Ethiopia A.D. 550–570, whose Viceroy Abreha, Governor of Yemen, tried to prevent the pagan pilgrims from going to Mecca and he also tried to destroy the K'aaba. Here I think we have the period when Shabwa was destroyed: or it might have been the previous Emperor Ella Asbeha 514–542.

"You might like to bring this to the notice of Major Hamilton in case he cares to pursue it farther. I think I got the information from Sir William Budge himself or his 'History of Ethiopia.' At the present moment I incline to the belief that Hamilton is right in presenting Shabwa as a pre-Muhammadan sacred city of the Himyarites, where they would prefer to be buried. This would be enough to attract the attention of Abreha, who was according to all accounts fanatically inspired by Christian zeal and would look upon the elimination of such a centre of pagan culture as a crusade of primary importance."

On this Major Hamilton remarks: "It is an interesting suggestion that Christians and not Muslims may have been responsible for breaking up Shabwa and other holy places. There seems a break at about A.D. 300, which is the date so far assigned to surface at Shabwa and Qohlan, so the earlier we can guess at the date of destruction the better. Also if Abreha put Marib 'to rights' he would not have missed the Nisab triangle, as Cheesman points out in other words."

STRATEGIC ROADS

Owing to the development and present requirements of the military position it has become necessary to transport large quantities of material between points not before used to any great degree for freight transit, therefore the construction and maintenance of great sections of highways are essential. Mr. W. E. Rudolph in an article, "Strategic roads" (*Geographical Review*, January 1943), summarizes the available information for roads of present importance in all the continents. As several of these have been described in recent numbers of the *Journal*, reference need be made here only to his sections on African and Far Eastern routes.

In discussing general considerations, Mr. Rudolph points out that roads are threatened by air routes, though the development of the threat will naturally take time. It has been estimated that in certain conditions air transport charges might now be as low as 10 to 20 cents per ton mile, which may be compared with the estimated charge of 27 cents on the Burma road. The present situation requires all-season roads, and this raises greatly the cost of maintenance in the tropics. Semi-desert regions present even greater difficulties than tropical forest, for lack of water imposes additional effort, and sandstorms impede building and operation. The tropical vegetation, though it has to be cleared and grubbed out, prevents the erosion that harasses the builders of semi-desert roads.

For obvious reasons exact details of routes, construction, and traffic are not forthcoming, and the author's notes on Trans-African routes are based largely upon the linking up of existing communications by rail, river, and motor road, with an estimate of the relative value of various lines. The trans-continental route to which he devotes most attention begins at the port of Duala in the Cameroons, which is linked by a metre-gauge rail to Yaunde, whence a route, formerly an all-season motor road as far as Garua, runs north to Fort Lamy, and thence to El Fashr and El Obeid, where it connects with the Sudan railways. An alternative route from Yaunde is the motor road to Bangui and thence *via* Bangassu to Juba on the White Nile. Other points of entry are Pointe Noire, whence there are rail and river connections to Bangui, and

Libreville, joined by a highway to Brazzaville on the latter route. To the north, the French Sudan, which, apart from the rainy season, is suitable for road building, affords another route, from Bamako to Zinder and the Lake Chad area. A certain amount of road development would link this route to the north-south railways, providing access from Lagos and Port Harcourt. To the north are routes of varying value across to the Mediterranean coast, the more important being the Zinder–In Saleh and the Gao–Colomb-Béchar. It is stated that commercial trucks have been running on the St. Louis–Casablanca route since 1937.

The most important of the routes linking Russia with China is that from the Turk-Sib railway at Sergiopol through Urumchi and Hami to Lanchow, about 2000 miles. Owing to the character of the surface, its transformation into a motor road has not been difficult. Truck traffic on the road in 1939 was estimated at 20,000 tons. A route of importance before the Japanese advance into Suiyüan left the Trans-Siberian railway at Ulan Ude (Verkhne Udinsk), 100 miles to the east of Lake Baikal, and crossed Outer Mongolia to Kalgan. The portion of this route in Russian territory is followed by a railway to Kyakhta, which is said to have been extended to Urga in Outer Mongolia.

Another possible route leaves the Russian railway at Osh to run *via* Kashgar to Hami on the Lanchow route. The earlier section across the Pamir presents difficulties, and a better connection is said to exist between Stalinabad and Kashgar.

THE DEVELOPMENT OF PORTO

We have received from Senhor Casimiro Fontes a pamphlet compiled by him which contains statistical information on the growth of population and economic development of Pôrto, based largely on the Census of 1940. The figures show the dominant position of the industrial city and port in the life of northern Portugal. The population of Pôrto and its five suburbs was over half a million (566,602), one-seventh of the total for the nine northern administrative districts, while that of the administrative district of Pôrto (938,928) was exceeded in the whole country only by that of Lisboã. In the decade the rate of growth of the city and environs was 15·8 per cent., as compared with the rate for all Portugal of 12·6 per cent. As in most modern cities, the outer districts are expanding more rapidly than the centre, the northern and eastern suburbs, Matozinhos, Maia, and Valongo, at twice the rate of the centre.

The importance of Pôrto is based upon good communications with its hinterland, which extends well beyond that portion of the Douro basin in Portuguese territory. Pôrto and its outport of Leixões handle 30·5 per cent. by value of combined Portuguese exports and imports, of which practically the whole balance (63·8 per cent.) pass through Lisboã. It is also a developing economic centre, in which the textile and metallurgical industries are prominent; the administrative district produces two-thirds of the anthracite mined in Portugal, and consumes a quarter of the electric power generated.

ADMINISTRATIVE CHANGES IN THE COLONY OF MOZAMBIQUE

We have been informed by the Foreign Office of administrative changes in the Colony of Mozambique. The territory of Manica and Sofala, formerly administered by the Companhia de Moçambique, has, on the lapse of the royal charter of 11 February 1891 granting sovereign rights for fifty years, been taken over by the State, and the arrangement of districts and posts has been remodelled. The Companhia de Moçambique, the last of the Portuguese

chartered companies, has governed the provinces of Manica and Sofala, including the important port of Beira, since 1891. Their officials where possible will be appointed to corresponding posts under State administration and the present Governor will retain some of the privileges given to the Governor of the Company. The special Company issue of currency has been stopped.

The Colony of Mozambique is now divided into four provinces: Sul do Save, Manica and Sofala, Zambesia, and Niassa. Sul do Save, comprising the districts of Lourenço Marques and Inhambane, has been increased and now consists of all the territories of the colony south of the Save; the chief town is Lourenço Marques. The province of Manica and Sofala, comprising the districts of Beira and Tete, is "limited to the south by the river Save, to the east by the Indian Ocean, the river Ghire [Shire], and the frontier of Nyasaland, to the west by the frontier of Southern Rhodesia, to the north-east by the river Zambese, from the sea to the confluence of the Ghire, and to the north by the frontier with Northern Rhodesia." The province of Zambesia has been reduced in size and now consists of the old district of Quelimane; the chief town is Quelimane. The old boundaries of the province of Niassa are maintained; the chief town is Nampula.

Notice of the impending changes was published on 10 February 1941, the date of the expiry of the Company's Charter. The privileged powers of the Company were extended until 18 July 1942 and a temporary regime was established until the end of 1942 to facilitate the transition. The State assumed full control over the territory at the beginning of 1943. These changes complete the administrative and territorial unification of the Portuguese Empire and are part of a general reorganization of colonial policy.

VILLAGE SETTLEMENT IN NIGERIA

The Library has obtained two numbers of a periodical *Farm and Forest*, begun some years ago by officers of the Forest Department, Nigeria, and it is hoped to complete the set. The present title was adopted in 1941, and the scope enlarged to include land use and rural planning throughout West Africa, as well as the administration and development of forest resources. The papers include accounts of the prevention of soil deterioration in the Tiv division by the use of fallow crops, the production of gum arabic in Bornu, new uses found for the raphia palm, and tidal swamp farming in Sierra Leone.

An illustration on a small scale of the best method of tackling native resettlement and the advantages of cooperation between all administrative departments, is a brief account of the Anchau settlement scheme by Dr. T. A. M. Nash. When it was found that one-third of the inhabitants of this area had sleeping sickness, and that anti-tsetse measures were impossible owing to the dispersion of the population, it was decided to concentrate settlement by moving outlying families into the central vacant areas, and to plan the settlements in order to form a tsetse-free corridor extending from Anchau south-eastwards towards the Bauchi light railway. This corridor is about 70 miles long and 10 miles wide, with a population of seventy thousand. Assistance was obtained from the Colonial Development Fund, on the condition that the economic condition of the area was improved.

The initial step was to survey the area on the scale of 1 mile to the inch, and to take a detailed census. The extent of the good arable land was then ascertained, and the direction the corridor should take to necessitate moving the minimum number of persons. The anti-tsetse measures require that the vegetation on the cleared streams should be kept down, and the minimum population density to secure this was estimated at 70 per square mile. The

amount of land per head of population allowed was 4·3 acres, or about 34 acres per family, a considerable increase on the previous ratio. Sixteen new villages were built and seven existing hamlets expanded. The sites were carefully chosen on well-drained ground, each village was provided with a cement-lined well, windbreaks, and fruit trees, and was made responsible for keeping a definite extent of stream frontage cleared. Unless the area under permanent cultivation can be maintained, the pressure on the outlying land will become too heavy for proper fallowing to be carried out, and soil deterioration will result; consequently every effort is made to build up and conserve a supply of animal manure. As regards produce, the aim is diversification, so that the well-being of the villagers will not depend upon one or two staple crops.

MEETINGS: SESSION 1942–43

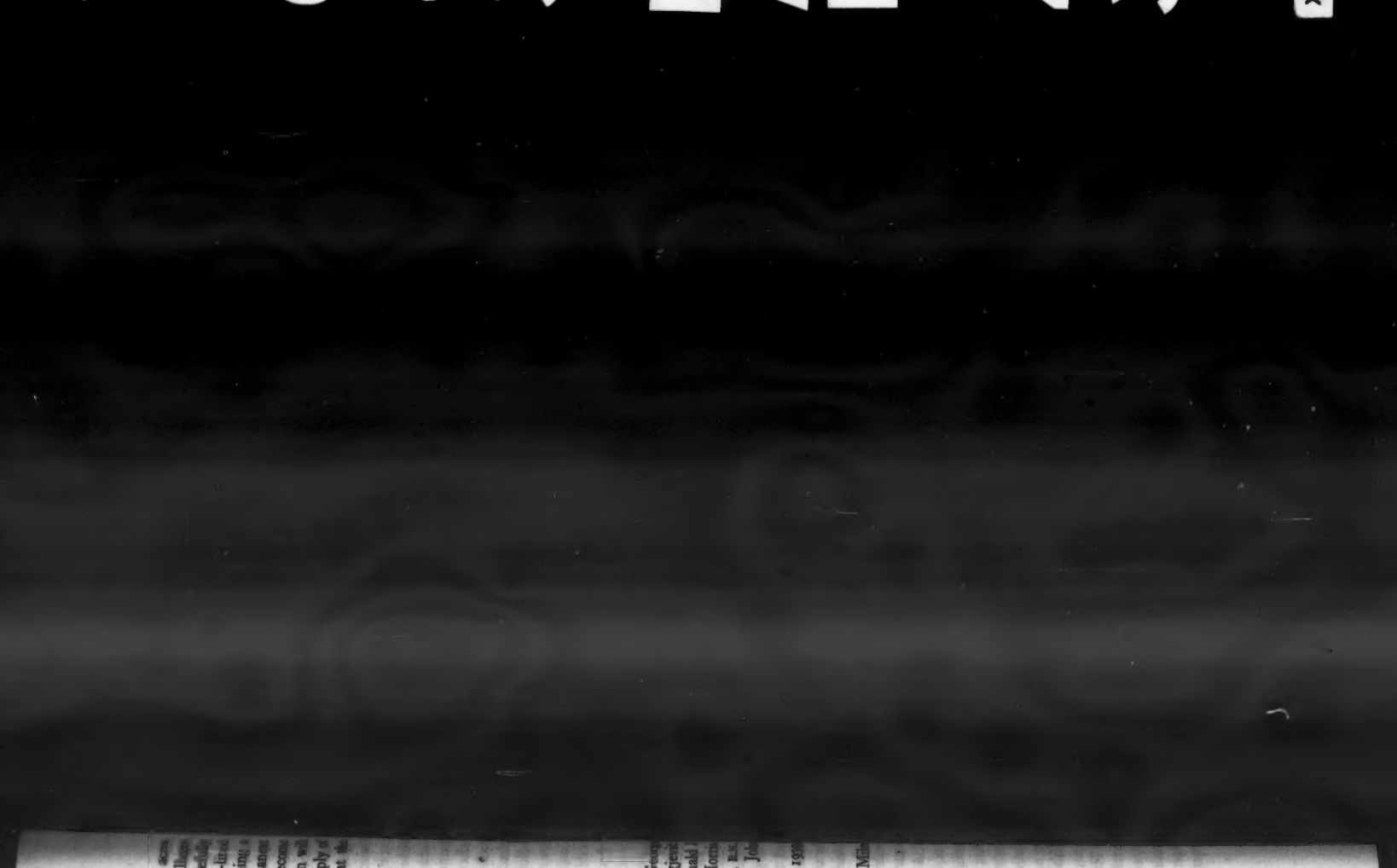
Eleventh Meeting, 8 February 1943. The President in the Chair

Paper: The Yugoslav–Italian frontier. By Dr. A. E. Moodie

Twelfth Meeting, 15 February 1943. The President in the Chair

Elections: J. A. Coker; Percy Thomas Noble Forester; Lieut. Hector George Percival Friendship, R.N.V.R.; O. Robert Ginnever; Theodore Gjwrgjevic; Charles Austen Greenwood; Mrs. Marion A. Haigh; Lt.-Commr. Donald F. Leake, R.N.; Mrs. Marian Kathleen Milne, B.SC.; Rev. David Lewis Morris; Lieut. Peter Mrosovsky, R.E., M.A.; Lt.-Commr. George Martin Pares, R.N.; H. Fauntleroy Saunders, M.A.; Ronald Thackrah, A.R.I.B.A., F.R.S.A.; John Frederick Boyle Vandeleur

Paper: The Swedish-Norwegian Expedition to North-East Greenland, 1939–1940. By Herr Kaare Rodahl

Thirteenth Meeting, 22 February 1943

Geographical Films: New Zealand and the Rockies. By Major D. D. Miles